Byron Shire Council

Biodiversity Conservation Strategy 2020 - 2030

Contents

Front cover photos:

Endangered Byron clay heath at Paterson Hill, Byron Bay, A. Baker

Byron Bay Diuris (Diuris byronensis) - Critically endangered (IUCN red list), A. Baker

Sharp Tailed Sandpipers, D. Pearce

Acknowledgements

This Strategy has been developed with contributions from Ecosure, Andy Baker (fire ecology), David Milledge (rainforest ecology), Jan Olley (native birds) and Sharon Slone (Bundjalung of Byron Bay Aboriginal Corporation (Arakwal). Byron Shire Council would also like to acknowledge members of the Biodiversity Advisory Committee and eight local ecologists who provided comments and peer review, including David Milledge, Mark Fitzgerald, Jan Olley, Mark Free and Luke Houghton.

Acknowledgement of Country

Council acknowledges and pays respect to the Bundjalung of Byron Bay, the Arakwal People as the Traditional Custodians of the land within Byron Shire, that form part of the wider Aboriginal Nation known as Bundjalung.

Council also acknowledges and respects the Widjabel and Mindjungbul people as Traditional Custodians within Byron Shire.

Council acknowledges the Aboriginal and Torres Strait Islander people who now reside within the area.

Our commitment to our environment

From the Mayor

Jingi Walla.

'Caring for Country' – at first glance this indigenous concept seems simple, obvious and easy to achieve. It is however, a highly developed connection and commitment to land, all that inhabit it and all natural processes that shape it. Caring for Country embodies the head, the heart and the will of our indigenous land stewards. It is an intention as well as an action.

It is in this spirit and being inspired and guided by our local indigenous mobs that we commit ourselves to this Biodiversity Conservation Strategy.

We are privileged that our home is also home to some of the last remnants of the ancient rainforests that dominated Australia 40 million years ago, as well as clay heath found nowhere else in Australia, rich wetlands that provide food and shelter for shorebirds migrating from as far as Siberia, and core habitat for threatened koalas, bats, frogs and reptiles.

With this privilege comes equal measures of responsibility.

With the challenges brought by human population growth and our impacts, comes the responsibility to seize the opportunities available to us to meet them. The answers found in this Strategy go beyond either just locking up land or competing against it, but in how we manage our land in our Shire.

This Strategy acknowledges that what has changed most of all is our knowledge and understanding of our natural environment. Alongside long held knowledge, we have new understanding of climate change projections and modelling of impacts on our threatened species; how we best manage exotic species to benefit wildlife habitat and natural habitat regeneration; and changes to our current understanding of how different ecosystems respond to disturbances, such as fire. If we want to be successful in protecting our biodiversity, it is critical that we listen to the experts, take this new knowledge on board and apply it to our planning for the future.

Habitat loss and the added pressures just mentioned cannot be managed by only leaving environments alone - they are best tackled when we work proactively with local groups and residents to adopt and apply best practice actions across our landscape.

Let's continue the tradition of caring for our country. Let's act to ensure our incredibly diverse and valuable flora and fauna can not only survive, but let's aspire to help them thrive. By learning and listening, through partnering and best practice, we can ensure we use our heads alongside our will and heart as a community and Council to manage our biodiversity, our food supply, our health and our economy, as well as leaving a natural legacy for future generations.

Simon Richardson
Mayor of Byron Shire Council

Jingi Wahlu Widtha Arakwal Jugun – 'Welcome to Arakwal Country'

Much of Byron Shire lies in the Arakwal Jugun 'Country' within the Bundjalung Nation. It is home to the Traditional Owners and Custodians of the land – the Arakwal People. Arakwal Jugun boundaries begin from Broken Head in the South, and go West to Newrybar, Bangalow and Mullumbimby and North to the Brunswick River.

Our relationship with this Country is more than just a place to live. It's the living, breathing source of all life, our spiritual home and home of our ancestors' spirits. In nature, creatures and objects have their place, and so do we - we look after Country and Country looks after us.

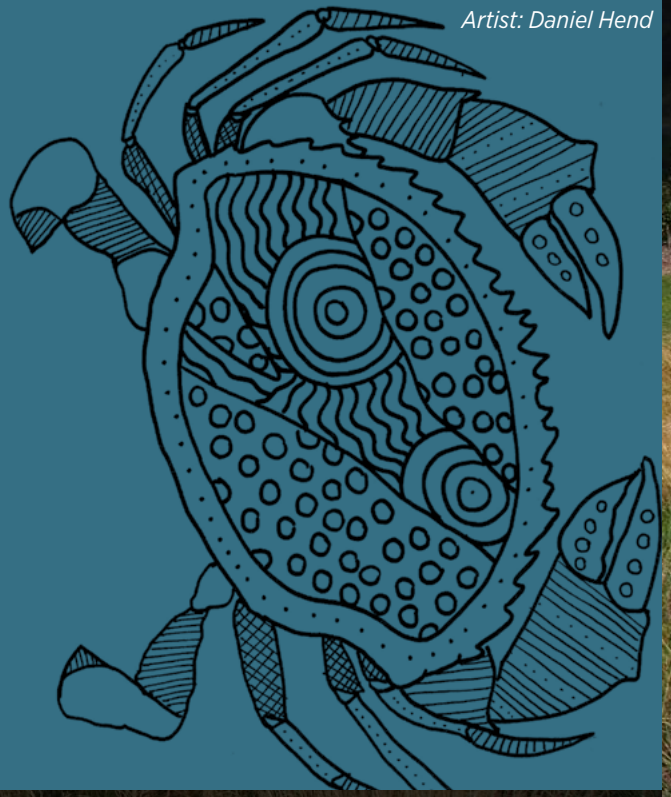
Our natural environment is inseparable from our culture, and so we must manage them together. Biodiversity to us is our stories, our social bonds, our food and medicines, our knowledge and our totems. Living culture, connecting to land, waters, plants and animals in the landscape has sustained our people for over twenty two thousand years and sustains us today.

We learn about Country from our Elders, who pass their knowledge on to following generations through stories and other cultural activities. These stories and traditions teach us what plants grow where, when we can hunt or fish in a sustainable way, when our landscapes are healthy, when they need fire and when they do not.

We continue to learn and educate our generations today and in the future, so this knowledge is not lost and we maintain and understand and manage our Country. Our Elders, our stories and our cultural activities are important to maintain, renew and repair associations with Country for new generations.

In Byron Shire, we want to work together with our communities, and with NSW National Parks and Wildlife Service, Byron Shire Council, local schools, other stakeholders and visitors to look after our Country, to learn about Country and to teach others about the importance of caring for Country.

In Arakwal Jugun, Arakwal Rangers and Field Officers work on Arakwal National Park, continuing to care for Country, and an Arakwal Education Officer teaches others through Dolphin Dreaming excursions in Cape Byron State Conservation Area. Through story and creative expressions, Arakwal Aboriginal guides present the life and culture of Byron Bay's Arakwal people. Arakwal have very successful Co-Managements in place with NSW Parks and Wildlife Service to manage and care for Country together.



Artist: Daniel Hend

Executive Summary

Biodiversity is the variety of all life on earth, and we depend on it for food, medicine, clean air, clean water, healthy soils and a safe environment to live in. Here in Byron Shire, we are living in one of the most biologically diverse parts of Australia, and we all have a responsibility to protect this environment for future generations.

This Biodiversity Strategy describes some of Byron Shire's unique biodiversity values, why they are at risk, and how we can use our current knowledge and resources to protect and enhance our biodiversity.

This Strategy outlines how Byron Shire Council, in partnership with the community, can contribute to biodiversity conservation. As a local government, we have responsibilities under state and federal environmental legislation, and we also manage land that provides important habitat for native wildlife.

In Byron Shire we are also fortunate to have an active community, who care about our wildlife, as well as visitors who come here for the natural environment and want to see it protected. Byron Shire Council has the opportunity to lead, educate and support our community, so that we can all work together to protect biodiversity.

Pacific Black Duck and Pied Stilt, R. Wisemantel

Through reviewing our current resources, achievements and legislative requirements, and talking with our community and with local expert ecologists, Council has developed four Biodiversity Aims:

AIM 1 – Lead

We are an organisation that provides clear direction, guidance and resources to conserve and enhance our biodiversity.

AIM 2 – Inform

Our community is well informed about biodiversity and what they can do to protect it.

AIM 3 – Support

Our land managers are well supported to conserve biodiversity across the landscape.

AIM 4 – Manage

We use best practice land management to improve ecological resilience and reduce threats to biodiversity.

Over the next decade, we will be working with our partners and the community to achieve these aims, by implementing our Biodiversity Action Plan. This action plan includes over 90 specific actions to help improve biodiversity conservation in the Shire, including:

- Updating our mapping and other environmental datasets to guide and prioritise on-ground environmental work and inform the development assessment process.
- Creating a biodiversity chapter in our Development Control Plan.
- Restoring biodiversity values on Council-managed land.
- Working with the community and other agencies to support, facilitate and secure funding for biodiversity conservation on private land.
- Providing better information to residents and visitors on our biodiversity values and what people can do to protect them.
- Keeping the community informed about threats to biodiversity and their responsibilities, including weeds, pest animals, domestic pets and fire.
- Identifying effective solutions to manage wildlife deaths on our roads.
- Working with universities to ensure best practice in threatened species management is integrated into Council's on-ground programs and projects.
- Partnering with our environmental volunteers to help support their amazing work and working together to maximise biodiversity benefits.
- Monitoring our existing biodiversity values so we can track our progress.

How to Read this Strategy

CHAPTER 1

Chapter 1 states Council's **vision** for biodiversity conservation in Byron Shire. Here you can find out **what biodiversity is** and **why biodiversity is so important** in Byron Shire. You can also learn some simple steps you can take to help protect biodiversity.

CHAPTER 2

Chapter 2 outlines the **issues.** This chapter describes some of the **threats to biodiversity** in Byron Shire, and also introduces some of the options available to **manage** these threats. Specific actions to manage biodiversity threats are listed in the Action Plan - Chapter 4.

CHAPTER 3

Chapter 3 sets the scene. This chapter summarises all the **information** Council used to develop the strategy. It includes information on our **community** and **economy,** and how these may impact on biodiversity, as well as key **community trends** and issues regarding biodiversity. This chapter also describes the **legislation** that governs biodiversity conservation in Byron Shire and the **resources and data** that are available to help us manage our natural environment.

CHAPTER 4

Chapter 4 is our **strategic framework**. This is the **main part** of the Strategy – the part that Council will implement under its **Operational Plan,** and report on annually. The Strategic Framework summarises Council's four biodiversity **aims**, and how we will deliver them – our objectives. It also includes a detailed **Action Plan**. If you want to find out specifically what Council is planning to do to help conserve biodiversity in the Shire, head straight to the Action Plan.

CHAPTER 5

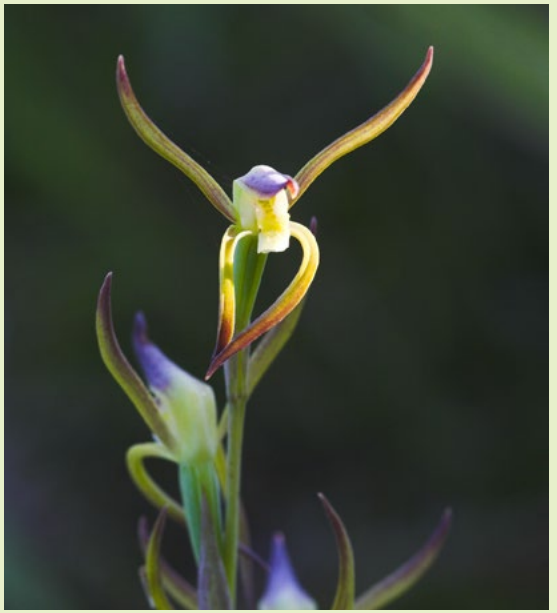
Chapter 5 summarises how Council will deliver the Strategy. This includes the **resources** available to help deliver the Strategy, and also how the Strategy Actions will be **monitored** and **reported**.

CASE STUDIES

Case Studies throughout the Strategy highlight the incredible work being done by **volunteer** groups in Byron Shire to help protect our biodiversity.

APPENDICIES

Appendices contain further information for people who want to know more detail – what are the likely impacts of **climate change** in Byron Shire? How is **fire** impacting on local biodiversity? Who did we consult with about this strategy? What **legislation and policies** govern biodiversity conservation at the local, state, federal and international level?



Brown Beak Orchid, A. Baker

Wetland, A. Underwood

Rainbow Bee-eater, R. Wisemantel

Chapter 1 - Introduction

Why do we need a Biodiversity Strategy?

Our Vision:
Biodiversity in Byron Shire is valued, protected and enhanced, through inspiring leadership, community engagement, expert input, urgent action and innovation.

1.1 Our Motivation - Why does Byron Shire Council Need to Conserve Biodiversity?

Biodiversity is essential to the survival of all life on earth. Biodiversity provides the ecosystem services that give us food, medicine, clean air, clean water, healthy soils and a safe, resilient environment to live in. It contributes to local livelihoods and economic development, and is a central component of many belief systems, world views and identities. Biodiversity and conservation are also integral to Byron Shire's 'clean and green' image – we need to manage our biodiversity to maintain the Shire's identity and character.

Superb Fairy-wren, R. Wisemantel

We all have a part to play in looking after our environment, and we all need to work together to prevent ecological decline. As a local government, some of the key responsibilities of Council are to:

- Manage our operations so as to minimise our own impact on biodiversity;
- Use our legislated and delegated powers and resources to protect and enhance Byron's biodiversity.
- Respond to the aspirations of the community to safeguard biodiversity for future generations while meeting today's needs through partnerships and community engagement; and
- Build the capacity of our community to understand and care for the plants and animals of the Byron Shire and minimise their own ecological footprint.

Byron Shire has a long history of environmental activism and volunteering that continues to inspire our community. The 2004 Biodiversity Conservation Strategy led the way for other NSW Councils, and Byron Shire was the first council in NSW to embed ecologically sustainable development into the 1998 Local Environment Plan. This new strategy aims to provide the leadership, innovation and community partnerships to continue to protect and enhance this legacy.

Box 1: What is Biodiversity?

Biodiversity, or biological diversity, describes the variety of all life on earth. It refers to plants, animals and micro-organisms, their genes and the communities and ecosystems of which they are a part. Biodiversity is usually recognised at three levels:

Genetic diversity:

The variety of genetic information contained in plants, animals and micro-organisms

Species diversity:

The variety of species

Ecosystem diversity:

The variety of habitats, ecological communities and ecological processes.

In the context of this Strategy, biodiversity refers to the species, ecosystems and genetic material that are locally native to Byron Shire.

Australia is one of 17 megadiverse countries - a group of countries that harbour more than 70% of the Earth's species (Steffen et al., 2009). About 85% of Australia's land mammals, 91% of flowering plants and 90% of reptiles and frogs are found nowhere else in the world. Over half of the world's marsupials live only in Australia.

Box 2: What You Can do to Help Protect our Environment

Here are some simple, practical things all of us can do to help protect our environment:

- Conserve habitats that support native fauna – even in small gardens, shrubs, dense patches of grass, rocks, hollow logs and clean water provide habitat for birds and mammals.
- Even weedy areas can be wildlife habitat – so try to learn more about the particular value of habitats in your area, e.g. are threatened birds breeding in your paddock of exotic pasture grasses? If so, delay slashing the paddock until nesting season is over.
- Control domestic pets - don't let dogs or cats roam freely, especially at night when native mammals are most active. Pets roaming in the bush are much more vulnerable to snakes and ticks.
- Recognise the importance to biodiversity of remnant vegetation and of nature reserves and national parks.
- Learn how to identify the local weeds and how to control them – local Landcare groups provide regular training in this.
- Never dump garden clippings in bushland, these are a source of invasive weeds.
- Talk with your neighbours and friends about biodiversity issues in your area, collective knowledge can be powerful.
- Become a citizen scientist.
- Slow down in the car to avoid collisions with wildlife, especially at night. Encourage others to do the same.
- Think about what you consume – over consumption contributes to climate change, and results in more plastic and other waste ending up in our environment, where it impacts native wildlife.
- Do not plant vegetation next to roads that attracts wildlife: e.g. flowering plants can attract lorikeets and flying-foxes, increasing the incidence of roadkill.
- Do not provide breeding sites for cane toads, they breed in open ponds.
- Volunteer – there are many local groups in this area working to protect and care for our native wildlife. They always welcome more help.

Reduce your Carbon Footprint

Climate change is one of the greatest threats to native wildlife.

Ways you can reduce your carbon footprint include:

- **Rationalise vehicle use; cycle or car pool when you can.**
- **Minimise overseas flights.**
- **Reduce your energy consumption at home and at work.**
- **Install solar panels and solar hot water systems.**
- **Insulate your house and plant native trees for shade.**
- **Use fans instead of air conditioning.**
- **Reduce your water use – creating clean water uses a lot of energy.**
- **Buy locally produced goods and services.**

1.2 Byron Shire Biodiversity – What Makes it Unique

Byron shire lies in one of the most biologically diverse regions in Australia. The wildlife is diverse because our environment is diverse. Environmental factors, including altitudes ranging from 0 to 800 metres, complex geology resulting in a mix of low and high productivity soils and a landscape history that includes numerous relatively recent rises and falls in sea level, have created a huge variety of ecosystems. Available habitats range from ancient old growth rainforests to tall Eucalyptus forests, rocky outcrops, heaths, sedgelands, fresh water swamps, mangroves and saltmarshes.

Climate is also important. Our historically mild climate and high rainfall allow plants to grow all year round, providing a constant food supply for fauna (Byron Shire Council, 2007). This means Byron Shire is an important stopping spot for migratory and nomadic birds and flying foxes passing through from the north and south of Australia.

Another key influence on our unique biodiversity is its history – or paleo-geography. Byron Shire occurs within the wet subtropical bioregion that straddles the NSW-Queensland border, known as the SE Queensland Bioregion. This Bioregion is a 'melting pot' - where many different plant and animal groups, from north, south and east, overlap – creating a mix of different biotas. Here we have habitat for species from hotter, drier areas to the north (the Torresian biota), from the cool wet eucalypt forests to the South (the Bassian biota), and also from the rainforest Irian biota of lowland New Guinea and the Eyrean biota of arid inland Australia (Figure 1.1). Byron Shire is also home to plants and animals originating from different periods in geological time, and this is what makes our rainforests so exceptionally important.

Byron Shire is at the epicentre of one of Australia's main rainforest refugia, extending from north east New South Wales to south east Queensland. (The other important refuge for rainforest is centred around the Wet Tropics in north Queensland, including the Atherton area). These small, isolated refugia are all that remain of the great rainforests of the Gondwanan land mass that once included Antarctica. These cool, wet forests dominated the Australian continent 40-20 million years ago, before it began to dry throughout the recent Pleistocene epoch. Today, plants and animals descended from Gondwanan lineages still inhabit our high and mid elevation rainforests, providing deep-time insights into the evolution and ecology of Australia's unique flora and fauna. They are of immense scientific significance and the Shire has a national responsibility to conserve its part of this evolutionary legacy.

The overall combination of neo- and palaeo-geographical influences is responsible for the exceptionally high biodiversity of the Shire's rainforests, and high level of species endemism in this region – i.e. the occurrence of species that are found nowhere else on earth. This is reflected in the large number of threatened rainforest species and endangered ecological communities occurring here and highlights the importance of rainforests as a focus for biodiversity conservation.

Durobby - Syzygium moorei

Giant Barred Frog, V. Silver

White-eared Monarch
Photo: D. Milledge

Eastern Blossom Bat
Photo: D. Milledge

Little Tern
Photo: D. Milledge

Sharp-tailed Sandpiper
Photo: D. Pearce

FIGURE 1.1

Byron Shire's diverse environment provides a home to species from all over the continent – from the cool southern regions to the hot dry inland and savannahs of the north and the warm, wet indo-tropics. Then there are the many migratory shorebirds that come from as far afield as Siberia and, most uniquely, those relictual plants and animals whose origins date back to the ancient Gondwanan forests that covered Australia 40 million years ago.

- Little Tern
- Whimbrel
- Pacific Golden Plover
- Bar-tailed Godwit
- Sharp-tailed Sand Piper
- Eastern Curlew
- Latham's Snipe

Northern Hemisphere Migrants

- Red Cedar
- White Booyong
- Pencil Cedar
- Eastern Tube-nosed Bat
- Eastern Blossom Bat

- White-eared Monarch
- Noisy Pitta
- Marbled Frogmouth
- Rose-crowned Fruit-Dove

Sunda and Irian

- Brown Tree Snake
- Northern Banjo Frog
- Common Planigale

Torresian

- Burton's Snake Lizard
- White Striped Freetail Bat

Eyrean

Bassian

- Eastern Spinebill
- Brown Striped Marsh Frog
- Eastern Falsistrelle

Gondwanan Relictual Species

LOW ELEVATION

- Hairy Quandong
- Ball Nut
- Giant Barred Frog
- Southern Leaf-Tailed Gecko
- Sooty Owl
- Fletchers Frog

HIGH ELEVATION

- Corokia
- Peach Myrtle
- Nightcap Oak
- Loveridges Frog
- Stephen's Banded Snake
- Satin Bowerbird

Fletchers Frog
Photo: D. Milledge

Stephen's Banded Snake
Photo: D. Milledge

Sooty Owl
Photo: D. Milledge

Case Study: Big Scrub Landcare

Big Scrub Landcare
The Voice of the Rainforest

Big Scrub Landcare's mission is promoting, facilitating and undertaking long-term restoration and ongoing care of critically endangered lowland subtropical rainforest. Since 1993, BSL has delivered over 55 projects, planted around 2 million trees and has contributed to the ecological restoration of around 600 hectares of remnants and the re-establishment of over 500 hectares of rainforest - increasing the total area of critically endangered lowland subtropical rainforest by an incredible 67%! Their work is vital – when European's settled the area, the Big Scrub Rainforest was cleared to less than 1% of its original 75,000 hectares.

BSL are also passionate educators. Their annual Big Scrub Rainforest Day brings together nature lovers to learn about all aspects of lowland subtropical rainforest and its restoration. There are walks, talks, displays, tree plantings, panel discussions and workshops led by expert ecologists and restoration practitioners. Big Scrub Rainforest Day is one of the most successful and enduring Landcare community engagement events in Australia and, to date, has attracted and inspired more than 25,000 attendees to care about and look after our region's precious rainforests.

Box 3: What is High Environmental Value Vegetation?

High Environmental Value vegetation was mapped for Byron Shire in 2017. This mapping is based on five criteria developed by the NSW Office of Environment and Heritage (now DPIE) for identification of high environmental value:

- Areas protected for conservation – including National Parks, Marine Parks and Crown Flora/ Fauna reserves.
- Native vegetation of high conservation value – including over-cleared vegetation types, threatened ecological communities, old growth forests, rainforests and littoral rainforests.
- Threatened species and populations – including key and critical habitat for threatened species, known areas of habitat and endangered species habitat.
- Wetlands, rivers, estuaries and coastal features of high environmental value – including coastal wetlands, riparian vegetation, vulnerable estuaries and intermittently closed and open lakes and lagoons.
- Areas of geological significance (none listed for Byron Shire).

Areas of mapped vegetation within the Shire that meet one or more of these criteria are mapped as HEV vegetation – in Byron Shire this is 43% of our land area! The HEV map assists Council in identifying key areas for conservation and restoration priority, as well as being a trigger for further investigation during development assessments.

Eastern Blossom-bat, D Milledge

Paperbark Woodland, Byron Bay, A. Baker

Subtropical Rainforest, Ocean Shores, A. Baker

Fawn-footed Melomys, D Milledge

Our Biodiversity

Byron Shire is located at the heart of the Wet Subtropics Bioregion – one of the most biodiverse regions in Australia, with:

The highest diversity of marsupials and microchiropteran bats of all Australia bioregions.

An equal diversity of frogs to the Wet Tropics.

The second highest bird diversity in Australia (next to the Wet Tropics)

Many relict species related to the flora and fauna of the ancient Gondwana continent.[2]

Our diverse ecosystems include:

Montane complexes | Subtropical rainforest, including floodplain and littoral rainforest | Wet and dry sclerophyll forest | Coastal heath and shrublands | Grasslands | Coastal wetlands | Estuaries, saltmarshes and mangroves

Our rainforests, wetlands and estuaries are an important winter feeding resource for migratory birds and bats from Australia and beyond[1].

- Over **600** native animals[4]
- **160** threatened animal species[4]
- **2,000 ha** koala habitat[3]
- **16** flying fox camps

- Over **1500** native plants[4]
- **145** threatened plant species[4]

- **24,300 ha** High Ecological Value vegetation, including **17%** of the Shire protected in national parks and reserves
- **11** Threatened Ecological Communities
- **148 ha** World Heritage Gondwana Rainforests
- **317 ha** of the remaining Big Scrub Lowland Subtropical Rainforest
- **92 ha** Littoral Rainforest
- **1,596 ha** Coastal (SEPP) wetlands[4,5]

References: 1 Byron Shire Council. (2019). *Integrated Pest Management Strategy.* | 2 Byron Shire Council. (2007). *Biodiversity in Byron Shire.* Mullumbimby, Australia: Author. | 3 Biolink. (2012). *Byron Coast Koala Habitat Study.*
4 Department of Environment & Heritage. (2020) *Bionet Atlas.* | 5 Department of the Environment and Energy. (2019). *EPBC Protected Matters Search Tool.*

Box 4: Native Birds - Residents and Visitors

Sooty Oyster Catcher, D. Milledge

Baillon's Crake, R. Wisemantel

Great Egret, R. Wisemantel

Our rainforests, eucalyptus forests, paperbark swamps, heaths, wetlands and even peoples backyards, provide habitat, food and shelter for many species of birds. Byron Bird Buddies have recorded over 300 bird species in Byron Shire – of which 48 are threatened species.

As well as the birds that live here, Byron Shire provides abundant resources for nomadic and migratory birds that stop over in different seasons to feed or breed, including the Rose-crowned Fruit-Dove, the Spectacled Monarch and the White-throated Needletail. Some of our most important bird habitats include:

ESTUARIES

27 different migratory shorebirds have been recorded using our estuaries, including Tallow Creek, Belongil Creek, the Brunswick River the West Byron Wetlands. These saltwater wetlands are home to the critically endangered Eastern Curlew and endangered Little Tern, and are a vital stop-over spot for birds recuperating after long journeys.

BEACHES

Three bird species nest on the shire's beaches and rocky headlands: the vulnerable Sooty Oystercatcher, endangered Pied Oystercatcher and critically endangered Beach Stone-curlew. Byron Bird Buddies work closely with NSW National Parks and Wildlife to closely monitor these species in the nesting season. Beach nesting bird nests are very exposed, and are extremely vulnerable to disturbance from dogs and walkers.

SUB-TROPICAL RAINFORESTS

Parts of the Nightcap Range Key Biodiversity Area fall within Byron Shire, including Nightcap, Goonengerry and Mount Jerusalem National Parks, and Whian Whian State Conservation Area. These areas include warm temperate and subtropical rainforest that provide important habitat for several bird species with very restricted ranges, including Albert's Lyrebird, Green Catbird, Regent Bowerbird, Paradise Riflebird and the Pale-yellow Robin. Fire, habitat clearing and invasive species are the main threats to these birds.

1.3 What is a Biodiversity Conservation Strategy?

Simply put, a strategy is a plan of action to achieve a goal. A strategy guides how we make decisions and allocate resources. A strategy keeps a business or organisation on track and stops it from going in too many different directions.

Byron Shire Council developed its first Biodiversity Conservation Strategy in 2004, with the following goals:

- To identify, protect and enhance Byron shire's native biodiversity through accessing reliable funds to educate the community about biodiversity issues and values, and
- To protect, restore and maintain ecosystems and ecological processes through the delivery of on-ground works and planning controls.

The 2004 Biodiversity Conservation Strategy has kept Council on track - achieving 80% of the planned actions to date (Appendix 1). But, fifteen years on, much has changed, including our knowledge of ecological processes, technology, environmental legislation, community priorities and our natural environment itself. To keep on track in a changing world, Byron Shire Council needs a revised Biodiversity Conservation Strategy, which builds on the original Strategy by setting out an updated action plan, guided by an updated vision, aims and objectives.

1.4 Our Guiding Principles

Council's 2004 Biodiversity Conservation Strategy was guided by a set of key principles to be considered when assessing Council activities and land use proposals (Box 5). These principles remain relevant today and align closely with the principles of Australia's Biodiversity Conservation Strategy 2010–2030 (Natural Resource Management Ministerial Council, Commonwealth of Australia, 2010). These principles have directed the development of this Strategies' vision, goals and objectives, and will guide Council's decision making over the lifetime of the Strategy, where a plan or action has, or is likely to have, a positive or negative impact on biodiversity.

BOX 5: Our Guiding Principals

- **Collective responsibility** – we all benefit from biodiversity and it is everybody's responsibility to protect, maintain and restore it. This requires inclusive management and cooperative partnerships between Council, landholders, community, private industry and other agencies.
- **Open and transparent consultation** - effective management of biodiversity requires input from the community and other stakeholders.
- **Education and engagement** – developing a culture of biodiversity protection, through improved understanding and appreciation for the many benefits biodiversity provides is fundamental to its conservation and enhancement.
- **Best practice** – ecosystem management must adapt to new science and on-ground knowledge. Planning and decision making should be based on reliable scientific and technical information, e.g. from peer reviewed journals or expert input.
- **In-situ conservation** – biodiversity is best conserved in its natural environment.
- **Protection of areas of regional significance** – areas of regional conservation significance and High Conservation Value must be protected and restored.
- **Restore connectivity** - the long term viability of biodiversity in Byron Shire depends on the identification, protection and restoration of wildlife corridors that link existing habitat.
- **A landscape approach** – to effectively conserve biodiversity we need to consider the whole landscape, including all land tenures and crossing shire boundaries.
- **Enhance resilience** - natural ecosystems are dynamic but have a finite capacity to recover from external impacts. The more diversity there is within an ecosystem, the more resilient it is to external threats and changes.
- **Understand threatening processes** – effective biodiversity protection requires identification, prevention and amelioration of the threatening processes that are impacting on it.
- **The precautionary principle** – Lack of full knowledge should not be used as a reason to postpone action to prevent environmental degradation. In applying the precautionary principle, decisions should be guided by careful evaluation to avoid, wherever possible, serious or irreversible damage to biodiversity.
- **Sustainability** – sound management requires ecologically sustainable development, which recognises environmental, economic and social values and accounts for inter-generational equity, long-term planning and accurate valuation of environmental resources.
- **Net biodiversity gain** – to achieve environmental sustainability, our biodiversity needs to grow. Actions that deliver a net biodiversity gain include restoration and management of ecosystems, reducing threats to wildlife, best practice management, increasing community capacity to protect our environment and strategic planning to prioritise conservation activities.
- **Foster Byron's 'green' identity** – biodiversity and sustainability are integral components of Byron's 'clean and green' image. Sound biodiversity management will enhance the Shire's green identity whilst maintaining its local character.

Chapter 2 – Threats to Biodiversity

Why is our biodiversity in decline?

Biodiversity in Australia is in crisis (Department of the Senate, 2019). The OECD ranks Australia as having the second highest rate of biodiversity deterioration, with a biodiversity status of poor to worsening (OECD 2019).

Pearson's Frog - Litoria pearsoniana, Photo: by S. Wilson

**Environment Protection Biodiversity Conservation Act 1999*

The NSW State of the Environment Report (EPA, 2018) lists a total of 46 key threatening processes in the state. Of these processes, 24 relate to increases in invasive animals and plants, and invasive species are also ranked as the number one threat under the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act), affecting the largest number of flora and fauna declared threatened, endangered or vulnerable (Kearney et al., 2018). Other key threats to wildlife and ecosystems in Byron Shire include:

- Clearing of native vegetation, including loss of hollow-bearing trees.
- Human-induced climate change.
- Disease and fungal infestations that weaken and kill native species, including Chytrid fungus in amphibians, Chlamydia in koalas and Myrtle Rust in plants of the Myrtaceae family.
- Inappropriate fire regimes that disrupt plant and animal life cycle processes and cause loss of vegetation structure and composition.
- Motor vehicle strike.
- Impacts of domestic pets on wildlife.

This chapter summarises our current understanding of some of the key local threats to biodiversity and some of the ways Council can act to reduce impacts of these threats.

Case Study: Landcare – A Shore Thing

Brunswick Valley Landcare Inc

"To conserve and restore our natural environment from forest to foreshore"

Brunswick Valley Landcare Inc (BVL) have been caring for our natural environment for over 15 years. BVL provides support for 36 locality groups, special interest groups and incorporated Landcare groups, including networking, workshops, advice and coordination of projects and funding applications.

2005 – Sand trapping in front of Whytes Cottage

One of the longest running Dunecare projects has been restoring the dunes at Byron Bay's main beach. Over the past 22 years, planting and direct seeding has been used to stabilise the dune and establish a self-sustaining ecosystem that provides habitat for Wrens, Silvereyes, Buff-banded Rails, Bush Stone-curlews and Pied Oystercatchers and protects the beach from coastal erosion. The vegetated dunes create a narrow, but important wildlife corridor linking Cape Byron Headland to Tyagarah Nature Reserve.

This project has been a team effort – the Green and Clean Awareness Team, a locality group of BVL, have been working in the dunes since 1997, with some initial reconstruction assistance from EnviTE and help from Green Corps to install lightweight fence posts that protect the vegetation and can be adjusted to accommodate growing sand dunes. The cycle of the foreshore has recently seen the dunes in retreat.

However this may well be the beginning of a new growth phase! The Green and Clean Awareness team meet regularly to continue restoration and tackle weeds and rubbish, and have installed signs to explain to beachgoers the values of this critical habitat.

2009 – Fully restored Spinifex and shrub zone

2.1 Invasive Species

In Byron Shire, over 250 environmental weeds pose a direct threat to biodiversity, including 12 known Weeds of National Significance, one invasive plant categorised in a Biosecurity Zone (Bitou Bush) and one invasive plant under a Control Order (Tropical Soda Apple), according to the Biodiversity Conservation Act 2016. Species including Camphor Laurel, Small-leaved Privet, Broad-leaved Privet, Mickey Mouse Plant, Lantana, Madeira Vine, Moth Vine and other garden escapees rapidly colonise fragmented vegetation remnants, threatening our rainforests and other vegetation communities.

The Shire is also home to eight pest vertebrate species (wild dogs, European red fox, feral cat, Indian myna, cane toad, mosquito fish, black rat and European rabbit), and other species such as feral deer are also emerging as a potential threat to biodiversity in the region. Domestic (companion) animals, particularly cats and dogs, also have a significant impact on native wildlife when they are allowed to roam freely.

Management of companion animals is regulated under the Companion Animals Act 1998, which is enforced by Council via compliance with the annual Compliance Priorities Program, Council's Enforcement Policy and directions from the Office of Local Government.

In Byron Shire, pest management is governed by the NSW Biosecurity Act 2015 and the Biosecurity Regulation 2017, implemented at a regional level by the Local Land Services North Coast Regional Strategic Weed Management Plan (2017-2022) and the North Coast Regional Strategic Pest Animal Management Plan (2018-2023), and locally through Council's Pest Animal Management Plan (2018-2023), Integrated Pest Management Policy (2018) and Integrated Pest Management Strategy (2020).

The Pest Animal Management Plan (PAMP) and Integrated Pest Management Strategy (IPMS) are sub-components of Council's Biodiversity Conservation Strategy, and are currently being implemented to manage pest plants and animals on Council land, and to support cooperative management of pest species across other land tenures. Key elements of these plans include:

- Development and implementation of a pest management education and awareness plan for Byron Shire.
- Development and implementation of pest animal operational plans.
- Implementation of a pest animal trapping program on Council land, plus support for trapping in key areas of wildlife habitat.
- A strong focus on the use of integrated pest management strategies – i.e. the use of environmental and life cycle information to manage pests in the most economical and least hazardous way (US EPA, 2019).
- Use of a pesticide use decision tree to identify the most effective integrated pest management method for particular species.
- Increasing ecological resilience (Box 6) through ecological restoration, to minimise the impacts of pest species.
- A comprehensive, and regularly updated, invasive plant species list, including flowering times and control methods.

Box 6: What is Ecological Resilience?

Ecosystems can be very complex. Each ecosystem is made up of the elements that inhabit it (like plants, animals, rocks and soils), and also processes that occur within it – including pollination, grazing, seed dispersal, decomposition and natural disturbance regimes. These processes are essential to keep the whole ecosystem working and healthy and able to support particular plants and animals.

The resilience of an ecosystem is its ability to adapt to and recover from disturbance, and maintain the processes that occur within it, when under stress. Disturbances can be natural, such as drought, flood and wildfire or human-made, e.g. land clearing, weed invasion and pollution. Generally, if an ecosystem experiences too few or too many disturbances over a short time period, the ecosystem processes don't work as well and the ecosystem becomes less and less resilient. Healthy ecosystems, with minimal unnatural disturbance and a rich diversity of plants and animals, are able to perform all their functions better and are generally more resilient.

Highly cleared ecosystems, such as the Big Scrub rainforest, are generally less resilient because small remnants are very isolated in the landscape. So if disturbance occurs, plants and animals aren't readily available nearby to recolonise the site and restore ecological processes.

Management actions can help improve the resilience of an ecosystem, for example mitigating threatening processes such as weeds and pest animals, re-establishing buffers and connectivity through planting adjacent to or between stands of vegetation, and using or excluding fire in a way that is appropriate for that particular ecosystem.

2.2 Land Use and Habitat Fragmentation

Historically, the greatest threat to biodiversity in the Shire has been the large scale removal of vegetation and draining of low lying areas for development, timber extraction and agriculture. This has changed local hydrology and left a fragmented scattering of remnant ecosystems, many of which are compromised by weed species. Clearing has broken the linkages that allowed fauna movements and gene flow in the region, resulting in reduced ecosystem function and resilience. Clearing of our riparian corridors also increases the risk of soil erosion, water pollution, sedimentation and degradation of ecosystems downstream.

Today, loss of habitat in Australia continues to drive loss of biodiversity, leading to species extinctions (Department of the Senate, 2019). In NSW, an estimated 2.3 million hectares of forest and bushland were cleared between 1990 and 2017 (Department of the Senate, 2019) with the loss of hollow bearing trees impacting the habitat of at least 40 threatened species (OEH, 2019). In Byron Shire, escalating land sale values, coupled with local population growth and that in nearby population centres in South East Queensland, coupled with escalating land sale values, is placing increasing pressure on land use and development (Byron Shire Council, 2019c).

Sadly, recent reforms to land management and biodiversity legislation in NSW have increased risks to local biodiversity. The Biodiversity Conservation Act 2016 (Appendix 2) allows for localised biodiversity loss to be calculated and offset outside of Byron Shire, potentially leading to a net biodiversity loss locally. Export of local biodiversity via the purchase of offsets is a real risk in areas like Byron Shire where high land prices make it cost effective to purchase offsets rather than avoiding biodiversity impacts on site.

Additionally, changes to the Local Land Services Act (Appendix 2) expand the former routine agricultural management activities (RAMAs) into Allowable Activities (Schedule 5A), which are self-assessable by landholders using the Native Vegetation Regulatory Map. This has resulted in an increased risk of vegetation clearing on rural land for purposes where development consent is not required under the EP&A Act 1979, particularly in areas where the Native Vegetation Regulatory Map is not yet complete.

There are several opportunities for Council to mitigate the impacts of clearing, and help encourage restoration of degraded and fragmented habitats:

2.2.1 Development of a Biodiversity Development Control Plan

Council's planning controls and databases will be critical elements in helping to retain and enhance the biodiversity values still present in the shire. Locally, Environmental Zone mapping provides some protection to areas mapped as Conservation (E2) Zones (Box 7), however, this mapping has limitations, including not recognising biodiversity elements on a fine (less than 0.5 ha) scale. A biodiversity chapter in Council's Development Control Plan (DCP), would set clear guidelines and standards to help conserve biodiversity during the development assessment process. The update would provide landholders and developers with alternative, best-practice acceptable solutions that are appropriate to the scale of development. In addition to reflecting recent changes to legislation, a biodiversity DCP can also help to protect elements (e.g. wildlife corridors, raptor nests, hollow-bearing trees and koala habitat) that may not be protected by other legislation.

BOX 7: LEP 1988, Deferred Matter and E-Zone Review

Land use changes since the 1988 Byron Local Environment Plan, have resulted in extensive areas of forest regrowth – many with high conservation significance. These areas with high conservation value were deferred from being zoned in the 2014 Byron Local Environment Plan, and, in Byron Shire, have been re-mapped using criteria given in the Northern Council's E-Zone Review Final Recommendations Report.

Over the last 2 years, this draft mapping of Environmental Conservation (E2) and Management (E3) zones has been verified through ground truthing and extensive landowner interviews to reach agreed outcomes wherever possible. To date 3,000 landowners in the Shire have been contacted to provide feedback in determining primary land use and defining environmental zones for their land, and over half of these areas have been verified for new zoning.

Zoning determines permissible land use and provides for development in appropriate places. E2 zoning allows certain activities (agriculture, recreation areas, roads) to a limited extent and under development consent. Under E3 zoning, a greater range of activities are permitted. However zoning areas don't recognise some biodiversity elements such as significant trees or significant vegetation under 0.5 ha.

The E-Zone review has allowed Council to identify private landholders that would like to do more to conserve biodiversity on their properties. Some landowners outside of 'deferred matter' areas have voluntarily dedicated their land to environmental zoning as they realise the limitations of the Local Land Services Act with regards to protection of native vegetation on rural land. As part of this Strategy, Council will be working with interested landholders to provide support and incentives for habitat protection and restoration.

2.2.2 Ecological restoration and revegetation

Even vegetation dominated by weeds can be returned to a healthy state, and restoration of degraded ecosystems often has a greater biodiversity benefit than replanting cleared areas. For example forest dominated by the invasive camphor laurel tree often contains an abundant seed bank of native rainforest species, deposited as droppings by birds feeding on camphor laurel fruits. Staged removal of camphor trees, together with follow-up removal of camphor seedlings can create good conditions for native rainforest seeds in the soil to germinate and grow (Big Scrub Landcare, 2019).

Byron Shire Council's Ecological Restorations team are working to restore and replant degraded habitat on Council managed land (Box 8). But to effectively restore our fragmented ecosystems, a whole of landscape approach is required. The first stage of this is to develop a priority restoration investment map – in other words, a map that shows where we should focus restoration effort to have the greatest conservation impact. This would include landscape features such as wildlife refugia, corridors and buffers, which are most needed for ecosystem function and survival of threatened species. Identifying priority areas for restoration investment will help guide future council-led restoration projects, as well as those being planned by private landholders and community groups, including Landcare, Bangalow Koalas and Zero Emissions Byron.

Many of Byron Shire's residents can help too – by restoring remnant vegetation on their land and planting appropriate local species to buffer forest remnants, and link these by corridors to other remnant stands. Council can use extension services, training and on-line resources to support private landholders who want to improve biodiversity on their properties through providing information regarding current best practice, suitable species, useful contacts and funding opportunities.

Box 8: Ecological Restoration in Byron Shire

Since 2004, 633 hectares of Council managed lands have been identified as needing ecological restoration or management. Council's bush regeneration team is progressively restoring these sites based on conservation priority. 60 Ha have been restored to date and restoration is underway on a further 183 ha.

Continual monitoring of restoration progress and adaptive management is used by the restorations team to ensure best practice and the most efficient use of resources. Site monitoring indicates that quarterly visits to active restoration sites to control weeds are essential to achieve a good restoration outcome, and to reduce costs associated with man-hours and herbicide use. Less frequent site visits result in a significant increase in weeds and ultimately a longer timeframe to restore a site. By 2021, the team aims to have over 200 hectares restored to a maintenance level. Ongoing maintenance at these sites will be balanced with programming the restoration of the remaining 400 hectares, with a combination of Council and grant funding.

Key sites currently being restored as part of Council's programme include the Bangalow and Vallances Road Sewerage Treatment Plant (STP) sites. At Bangalow STP, 5 Hectares were restored in 2017, with over 300 koala food trees planted as part of the Byron Habitat Corridors project, connecting to koala corridor plantings on adjacent private properties. At Vallances Road, areas of littoral rainforest and coastal swamp forest vegetation are progressively being fenced off from cattle and restored, improving fauna habitat and water quality along the Brunswick River.

2.2.3 Best practice management of Council asset upgrades

Council-managed land includes roads, sewerage treatment plants, parks and sports facilities, all of which periodically require repair, upgrade or development. Council is committed to undertaking its development with best practice, including carrying out detailed ecological assessments prior to development and ensuring no net loss of biodiversity during development. Where possible all biodiversity losses are avoided. Where a biodiversity loss cannot be avoided, for example where the site is constrained by boundaries, available space, utilities, other assets or meeting required standards, offsetting is used. In identifying suitable offsets, there are sometimes circumstances where weed removal and restoration of a remnant creates a greater benefit than tree planting. This is considered on a site by site basis, in consultation with ecologists.

Osprey, D. Milledge

Comb-crested Jacana

Vallances Road Sewerage Treatment Plant, W. Penn

2.3 Climate Change

2.3.1 Climate change – what do we know?

Climate change occurs when long term variations in climate differ from the average conditions of a previous time. While this has happened naturally in the past, human activities such as burning fossil fuels, deforestation and land-use change have altered the Earth's reflective capacity and increased the greenhouse effect. Global temperatures are now predicted to exceed 1.5 C warming by 2035 (Wuebbles et al., 2017; IPCC, 2019) and 3.2°C by the end of the century (CAT, 2019). Appendix 3 provides more information on current climate change projections and risks.

Human-induced climate change is a significant threat to our biodiversity. Impacts of climate change predicted by the International Panel on Climate Change (IPCC 2018, 2019) include:

- Increased frequency, intensity and length of heat-related events,
- Shifts in plant and animal ranges and abundance and changes in seasonal activities like flowering and breeding.
- Increased land degradation due to greater rainfall intensity, flooding, drought, heat stress, wind, sea-level rise and wave action.
- Coastal erosion impacting on more regions adding to land use pressure.
- Oceans becoming warmer and more acidic.

Some of these impacts are already being felt in Byron Shire and, by 2030, our North Coast region is predicted to be affected by warmer temperatures, more high temperature days, fewer frosts, decreased rainfall during winter and spring, increased severe fire weather days, increased intensity of storms and continued sea-level rise (OEH, 2014) – all of which will impact on our fragile natural environment.

Climate change is the most serious current and future threat to Byron Shire's unique rainforest biodiversity – particularly the relictual Gondwanan species of the cool, upper elevations (refer 1.2). Intact rainforest maintains its own micro-climate, with a closed canopy and a light and moisture buffering ecotone. But higher temperatures, longer droughts and more frequent wildfires, cyclones and floods weaken this resilience, resulting in desiccation, the exposure of trees to windthrow and the creation of light gaps allowing weed establishment. Climate change is also altering when plants flower and set seed, which in turn disrupts the life cycles of animals that play crucial roles in ecosystem functioning. Establishing buffers of locally suitable native plants around existing remnants can help protect our rainforest species, as well as increasing the capacity of the forest itself to cool the local micro climate and to slow down and reduce the impacts of wildfire. The edges of rainforest remnants contain a rich seed bank of native species that will establish quickly through assisted natural regeneration.

Box 9: What is Carbon Sequestration?

Carbon sequestration is the process of capturing carbon dioxide (CO_2) from the atmosphere, and storing it, to reduce CO_2 pollution and consequently mitigate global warming. Most plants naturally absorb atmospheric CO_2 through their leaves and, with energy from the sun, convert it to carbohydrate, or sugar, in a process known as photosynthesis. Because of this plants can contribute to the removal of excess CO_2 from the atmosphere.

Some ecosystems, for example coastal wetlands, saltmarshes and mangroves, are particularly effective in carbon sequestration, and are called 'blue carbon' ecosystems. Charcoal from landscape fires can also sequester large amounts of carbon in soils, wetlands or marine deposits (Santin et al., 2015).

Fletcher's Frog, D. Milledge

Eastern Tube-nosed Bat, D. Milledge

Case Study: Bangalow Koalas - Creating Koala Connections

Bangalow Koalas have an ambitious goal to recreate a koala habitat corridor from Byron Bay through to the hinterland and west towards Tenterfield. The aim is to slowly migrate koalas from the town, to areas that are safer, away from roads and cars.

In March 2018, Bangalow Koalas partnered with Byron Shire Council and the NSW Environment Trust, to plant 1,400 koala food and habitat trees at Tristania Street, including Tallowwood, Forest Red Gum, Grey Gum and Swamp Mahogany. This site is a critical link in the Bangalow Koala Corridor, leading west towards koala populations around Federal. 85 volunteers of all ages joined a community planting day to get the trees in the ground. Extensive coverage on social media and local ABC and NBN news piqued the interest of other landholders keen to sign up to get their properties involved in the corridor.

To date, 19,200 trees have been planted on 19 properties in less than 2 years, with over 50 other properties interested. With more funding secured and a new partnership with the International Fund for Animal Welfare, the dream to create a corridor form Byron Bay towards Tenterfield is well on the way.

Koala at Bangalow, Linda Sparrow

2.3.2 Climate change - what can we do?

Managing the impacts of climate change requires both adaptation and mitigation. Mitigation seeks to reduce net greenhouse gas emissions to limit the extent of climate change, for example by increasing energy efficiency, greater use of renewable resources, greater use of sustainable transport and adoption of sustainable agriculture. Adaptation focuses on increasing resilience to reduce harm from climatic impacts, employing engineering and built-environment solutions, technological solutions and ecosystem-based solutions.

Natural systems have a vital role in securing a sustainable future. Forests, grasslands, wetlands, soils, mangroves, sea grasses, phytoplankton and coral reefs all sequester atmospheric CO_2 (Box 9), thus reducing the amount that is left in the atmosphere (Ripple, Wolf, Newsome, Barnard and Moomaw, 2019). Agriculture and forestry-related land uses account for 23% of total man made greenhouse gas emissions (IPCC, 2019) – but better management of this land can mitigate climate change. Cropping practices such as minimum tillage increase the ability of soil to store more carbon, and increasing forest cover enhances evapotranspiration, leading to cooling of regional land surface temperatures during the growing season. Up to a third of emissions reductions needed by 2030 to meet the Paris agreement (less than 2°C warming) could be obtained with natural climate solutions (Griscom et al., 2017).

There is an urgent need to curtail vegetation loss and increase restoration and revegetation, to mitigate the effects of both land clearing and climate change. Some of Councils proposed strategies to do this are discussed above (2.2.1 and 2.2.2). Many of the potential impacts of climate change are not well understood, and restoration and revegetation planning will have to adapt as new knowledge becomes available, for example in relation to appropriate species selection under predicted climate scenarios. Protection and restoration of areas of biodiversity significance can assist the natural carbon sequestration process.

Council is currently reviewing its climate-related plans and policies to identify gaps to enable development of a Climate Change Adaptation Plan in 2020. Biodiversity will be a key consideration during development of adaptation strategies for the Climate Change Adaptation Plan, for example through:

- Identification of priority vegetation communities for carbon sequestration.
- Identification of the need for both vegetation restoration and revegetation to improve carbon sequestration.
- Identification of opportunities to implement sustainable farming practices.
- Identification of ecosystem-specific on-ground management actions and opportunities to improve ecological resilience to adapt to predicted climate change.
- Identification of wildlife migration corridors and refugia.
- Identification of opportunities to facilitate a local emissions offset market that enables tree planting programmes to generate emissions offsets and conserve biodiversity.
- Increasing biodiversity protection through local planning instruments.

Box 10: Climate Change Action at Byron Shire Council

Council has been taking action to reduce reliance on fossil fuels for over a decade through the Greenhouse Action Strategy 2004 and the Byron Shire Low Carbon Strategy 2014. Projects include Electric Vehicle and Bike Strategies, a switch to 100% carbon neutral Green Power electricity, sustainable investment and procurement policies, landfill gas capture and support for Community Gardens and food grown on public land. To date, Council has installed over 215 kW of solar on its assets and plans to install a further 7.8 MW.

The *Net Zero Emissions Strategy for Council Operations 2025* guides Council's path to net zero emissions for its operations by 2025 and 100% renewable energy by 2027, through development of solar installations and bioenergy facilities, waste management and resource recovery, community education and research into new technologies and funding. Where emissions reduction cannot be achieved, Council is committed to investing in and generating emissions offsets that are both local and ethical.

Council's *Climate Change Strategic Planning Policy 2014* focuses on climate change adaptation, and provides guidance on future flood, coastline management and biodiversity planning. The policy has the key objective of mitigating impacts associated with climate change on future generations through commitment to the precautionary principle, and requires appropriate buffering of natural ecosystems from development to allow room for the migration of communities that are impacted by coastal erosion and shoreline recession, salt water intrusion to ground water, tidal inundation and changes to hydraulic behaviour of waterways. The policy also requires identification and protection of current and future wildlife corridors to improve resilience of ecological communities and biodiversity.

2.4 Fire and Biodiversity

Both fire and a lack of it can threaten our biodiversity. High frequency fire that disrupts plant and animal life cycles is listed as a Key Threatening Process under the NSW Biodiversity Conservation Act 2016. But fire has also shaped some of Byron Shire's open Eucalyptus forest, grassland and heath communities, which provide habitat for species like the endangered Byron Bay Diuris and the vulnerable Eastern Chestnut Mouse.

In warm, wet places like Byron Shire, open forests and heaths need disturbance, like fire, to prevent the tree canopy closing over and shading out the understorey (Bond, 2019; Ondei et al., Krishnan et al., 2019). Comparison of Council's vegetation mapping between 1999 and 2016 (Landmark, 1999; Byron Shire Council 2017b), shows that canopy closure has decreased the extent of dry open forest in the shire by 75%, and of heathlands by 67%.

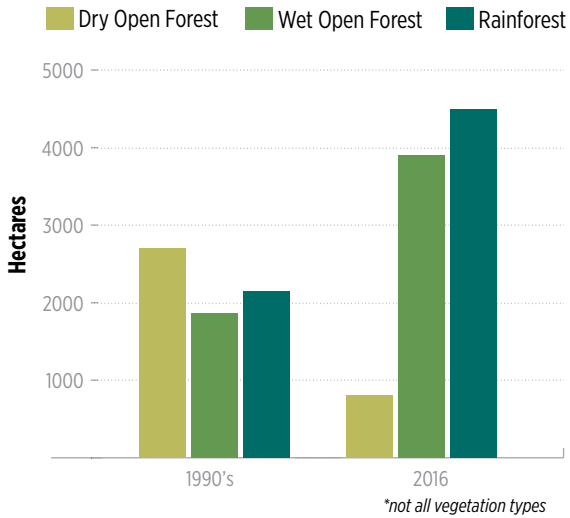


Figure 2.1 *Changes in wet and dry forest cover in Byron Shire from the 1990s to 2016*

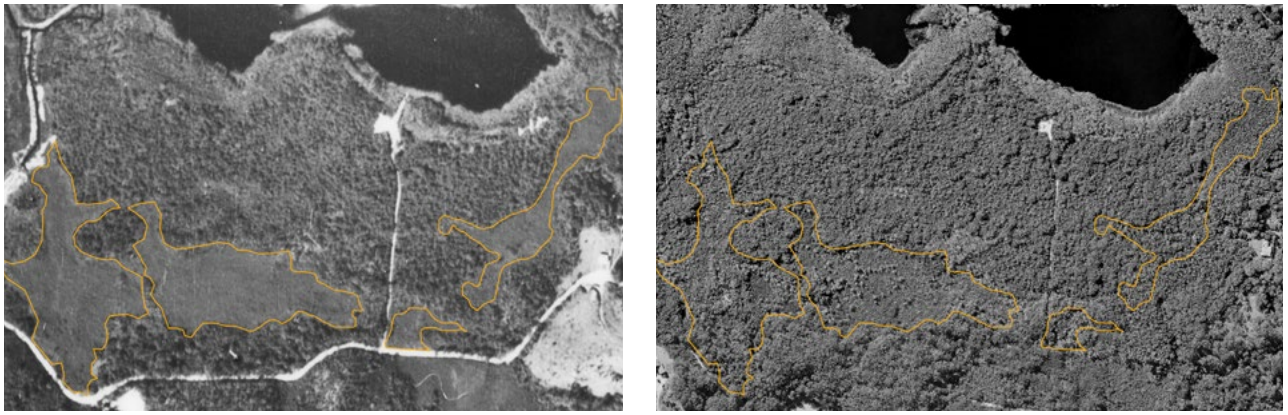


Figure 2.2 *Canopy closure in wet heathland at Suffolk Park 1971-2015*

Where a dense tree canopy shades out light, open forest understorey plants cannot reproduce and may become locally extinct in less than two decades (Baker, et al. 2020), with follow-on impacts for the animals that depend on them for food and habitat (Laurance, 1997; Jackson et al., 2011; Chapman and Harrington, 1997; Russell-Smith and Stanton, 2002; Woinarski, et al., 2004; Tasker et al., 2017; Pringle et al., 2009; Andersen et al., 2006). In Byron Shire, the lack of fire has allowed some open ecosystems to be invaded by fire-sensitive weeds like camphor laurel, privet and lantana, which can increase soil acidity and compete with native trees, resulting in decline in canopy eucalypts and loss of habitat for hollow-dependent owls, gliders and parrots.

The recent establishment of Bell Miners *(Manorina melanophrys)* in coastal Byron Shire, signals a high potential for Bell Miner Associated Dieback (BMAD) as an emerging threat to our open forests. BMAD is listed as a Key Threatening Process under the NSW Biodiversity Conservation Act (2016) and is decimating thousands of hectares of eucalypt forest from Queensland to Victoria.

While BMAD extends to coastal areas on the NSW south coast, in this region it has historically been restricted to the hinterland and ranges. However, over the last decade Bell Miner colonies have moved towards the coast, including recent colonies at Yelgun and the floodplain of the lower Brunswick River. Long-unburnt open forest with a dense mesic midstorey provides ideal nesting habitat for Bell Miners (Stone et al., 2008, Silver and Carnegie, 2017). Most open forests in Byron Shire are now in this condition (Byron Shire Council, 2017b

Not all ecosystems thrive after fire, and many need protection from it – the severe bushfire season of 2019 showed that even fire-sensitive rainforests are at risk of burning in extreme weather conditions. A proactive approach towards fire management in our remaining open-forest ecosystems could help restore these communities and reduce the risk of more damaging high-intensity fires. Cool, slow-moving burns, implemented in a patchwork over several years, allow wildlife to seek refuge and provide a diversity of habitat age classes for plants and animals to compete different life stages.

Patchy burns also break up fuel continuity in bushland, reducing risk of wildfire spreading into fire-sensitive habitats.

Fire ecology is a complex issue and there has been considerable new research on this subject since publication of Council's 2004 Biodiversity Conservation Strategy. Appendix 4 provides a more detailed review of emerging fire ecology issues in Byron Shire.

Case Study: Restoring Fire to Protect Broken Head's Open Forests

Following extensive losses elsewhere, Broken Head and the Koonyum Range are now home to the last sizeable stands of dry open forests remaining in Byron Shire. In these areas, poorer soils have slowed the rate of canopy closure, preserving rich understoreys of shrubs, grasses and ferns beneath open canopies of old-growth Eucalypts. These forests provide known habitat for numerous threatened fauna including the Glossy Black Cockatoo, Koala, Wallum Froglet and numerous insectivorous bats. However, after many decades without fire these forests are being transformed by invading rainforest pioneers and Camphor Laurel.

Recently however, a passionate group of landowners in Broken Head is working together to protect these precious forests through the restoration of regular ecological burns and bush regeneration. Working in partnership with the NSW Rural Fire Service, the Nature Conservation Trust, Southern Cross University, Byron Shire Council and the Firesticks Indigenous Alliance, landowners aim to restore the fine-scale mosaic burning which would have maintained the biodiversity of these forests over millennia. Following a 50-year absence, the first ecological burn in the forests of Broken Head was undertaken as part of the Hotspots Fire Project. Bush regeneration, planning and assessment is currently underway in preparation for future burns.

The restoration of fire to the forests of Broken Head will have a range of complimentary benefits including:

- protection and restoration of habitat for threatened plants and animals such as rare orchids, wetland frogs and koalas
- support the practice, promotion and renewal of Aboriginal cultural burns
- improved safety of residents and property from high intensity bush fires
- restoration of carbon sequestration pathways.

Old growth dry open forest in Broken Head. A. Baker

Box 11: New Research Sheds Light on Best Practice Koala Conservation

A number of recent studies have significantly changed our understanding of what trees are important to koalas. We now know that there are a large number Eucalyptus species with high koala use in this area (OEH, 2018a). We also know that koalas favour different trees depending on environmental conditions. For example koalas favour different species during times of drought when leaf moisture decreases and foliar chemicals change (Mella et al., 2019; Reckless et al., 2018), and also where essential riparian habitat exists providing refuge (Smith et al., 2013). Protecting the whole range of trees used by koalas will be particularly important as our climate changes.

High Use Trees in Byron Shire
Tallowwood ***Eucalyptus microcorys***
Red Mahogany ***E. resinifera***
Swamp mahogany ***E. robusta***
Small-fruited grey gum ***E. propinqua***
Forest red gum ***E. tereticornis***

Significant Use Trees in Byron Shire
Flooded gum ***E. grandis***
Sydney blue gum ***E. saligna***
Grey ironbark ***E. siderophloia***
White mahogany ***E. acmenoides***
Blackbutt ***E. pilularis***
Thin-leaved stringybark ***E. eugenioides***
Tindale's stringybark ***E. tindaliae***
Scribbly gum ***E. signata***
Turpentine ***Syncarpia glomulifera***
Forest oak ***Allocasuarina torulosa***
Broad-leaved paperbark ***Melaleuca qinquenervia***

New research into koala movements indicates that long distance dispersal, particularly by males, is more common than previously thought (Norman et al., 2019). The research also shows that home ranges vary between regions – meaning that management actions that are effective in one region, may not work in a different landscape. This understanding may be critical in identifying effective habitat corridors for local koalas.

Koala species distribution modelling (Santika et al., 2014) also predicts that western limits of koala distribution may shift east due to reduced rainfall and water availability in western areas as climate and land use changes – increasing the importance of eastern regions like Byron Shire in koala habitat conservation.

Another recent study (Ward et al., 2019) notes that koalas are important an 'umbrella species': where effective conservation effort is focussed on all the threats faced by koalas, it benefits an additional 10 threatened species at a cost of $4.6 million/year. Other local species identified as cost-effective umbrella species include the Australasian bittern, far eastern curlew and red goshawk.

Byron Shire Council is currently collaborating with the University of Queensland, Friends of the Koala and other North Coast councils to improve our understanding of local koala habitat preferences. New habitat mapping, using a combination of field survey methods and innovative geographic citizen science, is informing Council's prioritisation of koala habitat restoration projects.

Koala, K. Fielding

Chapter 3 – Setting the Scene

What information underpins the Biodiversity Strategy?

This Chapter summarises the information Council used to develop our Biodiversity Conservation Strategy.

In this chapter you can find information on:

- Our community and how we impact on biodiversity.
- The legislative and policy framework that governs how biodiversity is managed in Byron Shire.
- The tools and datasets available to support biodiversity conservation.
- Key community trends relating to biodiversity conservation.

3.1 Our Future – How is Our Community Changing?

3.1.1 Our population

Byron Shire's population is growing steadily by 1% every year, adding pressure on housing, roads and our environment. By 2036 a further 3150 homes will be needed to meet projected population growth (DPIE, 2017).

3.1.2 Our visitors

While visitors benefit the local economy, they also put increasing pressure on our built and natural environment. Visitor numbers have increased by 20% in the last 8 years, and the shire currently hosts over 2 million visitors per year (.idcommunity, 2019). Projected population growth in South East Queensland from 3.5 to 5.3 million people over the next 25 years will see Byron Shire's visitor numbers continue to grow (Byron Shire Council, 2019c).

Because they make up such a significant proportion of our population, Council needs to encourage visitors, as well as residents, to help conserve our local biodiversity. Council is developing a Sustainable Visitation Strategy that aims to encourage environmentally responsible and sustainable tourism products and visitor behaviour. Many of our visitors come here because of our natural environment and support environmentally responsible tourism (Byron Shire Council, 2019b), so there is an opportunity for the visitor industry to build on this demand, with a greater focus on eco-tourism.

3.1.3 Our economy

Traditional regional businesses such as farming, retail and hospitality remain the foundation of our economy, but small business is also booming. 25% of existing local businesses have indicated they will require more retail, warehouse and office space in the next two years (Byron Shire Council, 2018), which will put increasing pressure on already limited land availability (Byron Shire Council, 2019a).

Local businesses are increasingly committed to environmental sustainability: 75% have recycling programs and flexible working, 35% have rain water tanks and solar panels, and 25% purchase green power (Byron Shire Business Survey Report 2017-18). Council programs such as Plastic Free Byron and Love Food Hate Waste are working to support environmental sustainability in the business community.

3.1.4 Our land managers

While there are many farmers and growers in Byron Shire, the number of city professionals purchasing rural properties is rising, and since the 1960's, many landholders and Landcare groups have revegetated their land. The decrease in working farms poses risks of reduced food security, as well as potential environmental issues resulting from lack of experience in land management, but also presents opportunities to encourage new landholders to restore and protect biodiversity on their properties.

Bundjalung of Byron Bay Aboriginal Corporation (Arakwal) and Local Aboriginal Land Councils also manage land in the Shire and have their own on-site bush regeneration teams. Council needs to work proactively with these groups to manage biodiversity across Country.

Case Study: Byron Bird Buddies – Wild About Birds

Originally started in 2004 to conserve breeding habitat for Little Terns in the Belongil Estuary, Byron Bird Buddies has become an advocate for the conservation of shorebirds, waterbirds and bush birds across the NSW north coast.

Byron Bird Buddies volunteers carry out hundreds of hours of bird surveys each year, providing vital information on our local bird populations that can be used by local agencies, including NSW Parks and Wildlife and Byron Shire Council, to inform better conservation decisions.

Community education is also a big part of their work, and the Bird Buddies have developed posters, birdwatching guides for Byron Shire and an educational package for schools: Wild About Birds, to help inspire others to learn more about birds.

In November 2017, BBB expanded their normal community education program to curate an art exhibition showcasing the beauty of our native birds through the work of some talented artists. The exhibition travelled around six local community venues, Byron Library, Mullumbimby Library, Bangalow Heritage House, Byron Shire Council Art Cube, Mullumbimby RSL, and Cavanbah Sports Centre, exposing large numbers of the broader community to our native wildlife and how we can help protect it.

Rufous Fantail, Sue McLeod

Our Community

Byron Shire is located in the Northern Rivers region, and shares boundaries with Tweed, Lismore and Ballina local government areas.

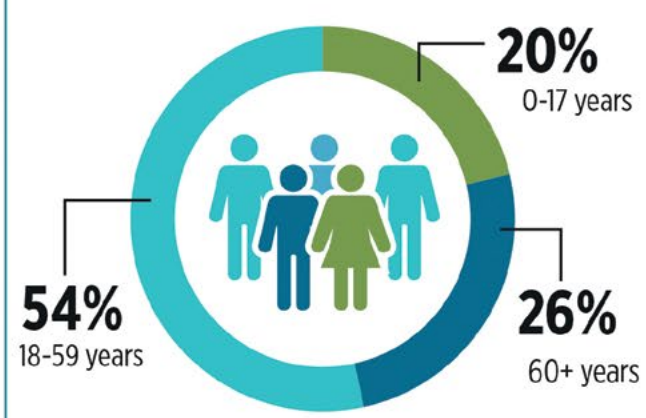
Population: 34,5741

Population density: 0.61 persons/ha[1]

Around 1% population growth per year[2]

546 farms[2]

13,585 residential properties covering 45% of the land area[2]



Byron Shire is part of the Bundjalung Nation, with 13 clans from the Clarence River in the south to the Logan River in the north.[3]

Arakwal Country

extends from Broken Head west to Newrybar, Bangalow and Mullumbimby, and north to the Brunswick River. Further west is Widjabal Country. Minjungbal Country lies north of the Brunswick River. [3]

Arakwal Corporation and Jali, Ngulingah and Tweed-Byron Local Aboriginal Land Councils manage land in or adjacent to Byron Shire.[4]

74% of people who work in Byron Shire also live here[2]

903 people ride their bike or walk to work[2]

1,822 people work from home[2]

Over two million visitors per year.[3]

We care about the environment:

Over **650 environmental volunteers** contribute over **37,000** hours to environmental work each year.

24 Landcare groups manage 18 km² of native vegetation.

110 properties are registered for **Land for Wildlife.**

Byron Shire has an inclusive, engaged community. We are farmers, professionals, technicians and families, in a region that attracts innovators, entrepreneurs, creatives and tree and sea changers.[2]

References: 1 .idcommunity. (2019) Byron Shire. economy.id.com.au/byron/about | 2 Byron Shire Council. (2019). Byron Shire Sustainable Visitation Strategy 2020-2030
3 Arakwal People of Byron Bay. (2019). About Us. | 4 Byron Shire Council. (2019). byron.nsw.gov.au

3.2 Legislation and Policy

This Biodiversity Conservation Strategy sits within a broader context of legislation, planning policies and strategies that relate to environmental management. This strategy seeks to build on the directions set out in the various state and regional biodiversity plans in a local, Byron Shire, context, and to use existing environmental legislation as a framework to support biodiversity conservation in the Shire.

However, some legislation and policies are likely to change over the timeframe of this Strategy, and some strategy actions may need to be updated accordingly. Current relevant legislation and policies are described in Appendix 2 and summarised in Figure 3.1 on the following page.

"We want to see Country how it used to be. We want to continue to look after Country and want it to look after us. We want our people to be back on Country, caring for and using Country like we always have. We want to share parts of our culture with the wider community so they learn about and respect Country like we do. We want everybody to work together to keep Country clean and healthy."

Aunties Lorna Kelly, Dulcie Nicholls and Linda Vidler, 2003

Artist: Rikkara McGuiness

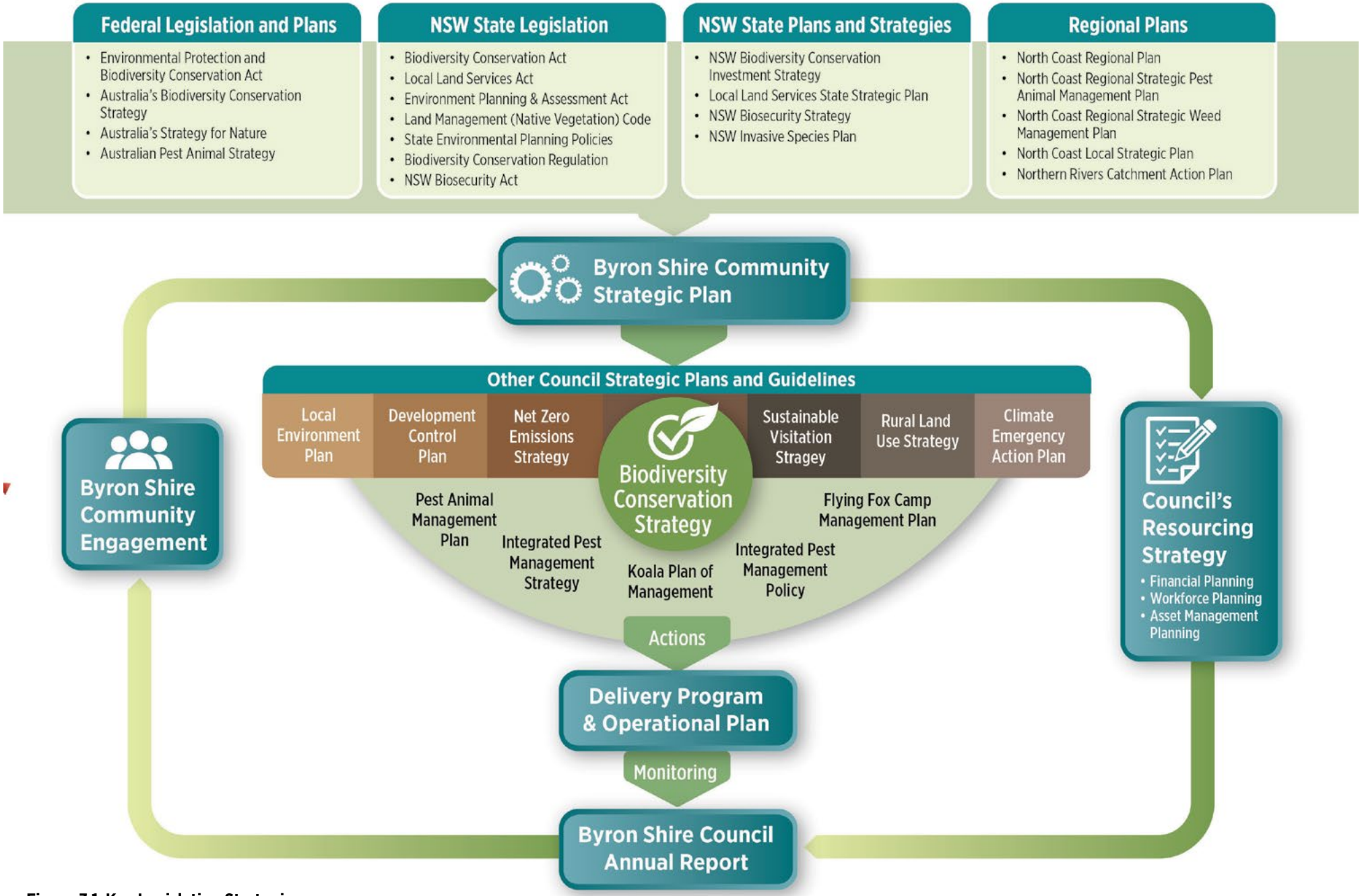


Figure 3.1 Key Legislation Strategies

3.3 Biodiversity Planning Tools

Up to date information, standards and codes are critical to guide best-practice biodiversity management and planning decisions. The types of information available within Byron Shire range from State-wide threatened species and vegetation mapping databases to site specific surveys carried out during planning assessments or as part of ecological restoration activities.

Table 3.1 summarises key current datasets that are available to Council and the community to assist with implementing this Strategy. Electronic links, rather than printed maps, are included here because these tools are living documents that are regularly updated or revised as new information becomes available.

Photo right: Vanilla Lily, A. Baker

Table 3.1 Biodiversity Planning Tools

Information Source	Description	Link	Administered by	Comments
Byron Shire Council GIS database	Includes regularly updated information on local biodiversity and land management including • Aerial photography • Threatened flora and fauna • Threatened fauna habitat • HEV vegetation • Bush regeneration zones • Waterway buffers • Protected areas • Bushfire vegetation categories	https://www.byron.nsw.gov.au/Services/Online-mapping-tool	Byron Shire Council	Biodiversity Conservation Strategy Action 3.5.
BioNet Atlas of NSW Wildlife	Database of recorded species sightings in NSW. • Includes flora and fauna, communities, threatened species and systematic survey data.	https://www.environment.nsw.gov.au/wildlifeatlas/about.htm	NSW Department of Planning, Industry and Environment	Relies on licence holders to supply records, so does not reflect a comprehensive list of all species records. Other wildlife records databases (e.g. eBird) should be reviewed for a complete picture.
BioNet Vegetation Classification application (VIS)	Information about NSW vegetation communities. • This includes Plant Community Types - the master community-level typology used in NSW's planning and assessment tools and vegetation mapping programs.	https://www.environment.nsw.gov.au/research/Visclassification.htm	NSW Department of Planning, Industry and Environment	
Biodiversity Values Map	Mapping tool that identifies land where the Biodiversity Act 2016 applies through entry into the Biodiversity Offset Scheme.	https://www.lmbc.nsw.gov.au/Maps/index	Department of Planning & Environment	Updated every 90 days.

Information Source	Description	Link	Administered by	Comments
Native Vegetation Regulatory Map	Mapping tool that identifies differing land codes applicable under the Local Land Services Act 2013	https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=NVRMap	Department of Planning & Environment	
State Environmental Planning Policy (SEPP) (Coastal Management) 2018 - maps	Mapping tool that identifies Coastal Wetlands and Littoral Rainforest where the Coastal SEPP applies.	https://webmap.environment.nsw.gov.au/PlanningHtml5Viewer/?viewer=SEPP_CoastalManagement	Department of Planning & Environment	
SEED Sharing and Enabling Environmental Data Portal	Data portal to search, contribute to and visualise NSW environmental data. The portal includes over 100 environmental datasets published by government agencies. Provides information on the data and different format options for data downloads.	https://datasets.seed.nsw.gov.au/	NSW Department of Planning, Industry and Environment	Enquirers can also contact SEED to seek assistance with finding information. The Biodiversity Conservation Trust is currently updating SEED with information regarding Stewardship sites.
NSW Koala Habitat Information Base	State wide spatial data on koala habitat, likelihood, preferred trees and sightings. Includes: • Koala Habitat Suitability Model • Koala Tree Suitability Index • Koala Likelihood Map • Areas of Regional Koala Significance.	https://datasets.seed.nsw.gov.au/dataset/koala-habitat-information-base	NSW Department of Planning, Industry and Environment	
SEPP Koala Habitat Protection 2019	This policy defines core koala habitat, provides a comprehensive list of preferred koala feed trees, and provides two maps to help protect koalas across NSW: • The Koala Development Application Map • The Site Investigation Area for Koala Plans of Management Map	https://www.planning.nsw.gov.au/Policy-and-Legislation/Environment-and-Heritage/Koala-Habitat-Protection-SEPP	NSW Department of Planning, Industry and Environment	This SEPP came into effect in March 2020. Under the Biodiversity Strategy Council will review the new SEPP to update our own planning and operations in relation to koala conservation.
Protected Matters Search Tool	Data portal used to generate a report that will help determine whether matters of national environmental significance or other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 are likely to occur in your area of interest.	https://www.environment.gov.au/epbc/protected-matters-search-tool	Australian Government	Any information provided through this facility is indicative only, and local knowledge and information should also be sought where possible.

Information Source	Description	Link	Administered by	Comments
Biodiversity and threatened species resources for local government web portal	Provides a central resource for local government staff to easily access environmental information to assist them in understanding their obligations and functions under various legislation relating to biodiversity and threatened species, including • surveys, • mapping datasets, • checklists and guidelines for environmental impact assessment and • best practice protocols and guidelines for environmental management.	https://www.environment.nsw.gov.au/biodiversity/BiodiversityResources.htm	NSW Department of Planning Industry and Environment	
Australian Government Biodiversity web page	Contains information relating to: • Australia's Biodiversity Conservation Strategy • EPBC Act • Migratory Species • Wildlife trade • National science and research programs • National biodiversity initiatives	http://www.environment.gov.au/biodiversity	Australian Government Department of Environment and Energy	
PlantNET NSW Flora	A comprehensive plant database for NSW, derived from the Flora of New South Wales. Includes information on • plant names, • distribution, • plant identification keys, • Australia's Virtual Herbarium	http://plantnet.rbgsyd.nsw.gov.au/ http://plantnet.rbgsyd.nsw.gov.au/WeedAlert/	National Herbarium of New South Wales	
Planned Burn Guidelines – South East Queensland Bioregion	Guideline to support planning and implementation of planned burns to protect life and property and maintain healthy ecosystems.	https://parks.des.qld.gov.au/__data/assets/pdf_file/0025/152566/pbg-assess-a5.pdf	Queensland Government Department of National Parks, Recreation, Sport and Racing	
Department of Environment and Energy Data Portal	An open data list of environmental data held by the department that is made available using open (Creative Commons) licence conditions.	http://www.environment.gov.au/about-us/environmental-information-data/open-data	Australian Government Department of Environment and Energy	

Information Source	Description	Link	Administered by	Comments
Mobile phone applications for recording wildlife sightings	Several mobile applications that record sightings by environmental professionals and the community currently have potential to provided useful biodiversity data. These include: • Feral Scan • I Spy Koala	https://www.feralscan.org.au/ https://koala.nsw.gov.au/i-spy-wide/	Centre for Invasive Species Solutions NSW Department of Planning, Industry and Environment	The value of these datasets is dependant on level of use, and new applications are likely to become available over the course of this plan.
eBird	eBird is the world's largest biodiversity-related citizen science project, with more than 100 million bird sightings contributed each year by eBirders around the world. eBird data document bird distribution, abundance, habitat use, and trends, using free mobile app allows offline data collection anywhere in the world.	https://ebird.org/home	The Cornell Lab of Ornithology	May provide more bird records than available on BioNet
Friends of the Koala – Koala Sightings database	Website enabling members of the public to report koala sightings, and also age, sex, health if available.	https://www.friendsofthekoala.org/report-a-koala-sighting/	Friends of the Koala	All FOK records are uploaded annually to BioNET
Roads and Maritime Services Biodiversity guidelines	RMS have developed detailed guidelines for managing biodiversity around road developments and upgrades: • Best Practice Guidelines for Biodiversity and • Code of Practice for Minor Works in NSW Waterways	https://www.rms.nsw.gov.au/about/environment/protecting-biodiversity/index.html	NSW Government Transport – Roads and Maritime Services	
National Light Pollution Guidelines for Wildlife	Draft guidelines providing theoretical, technical and practical information to assess if a lighting project is likely to affect wildlife and the management tools to minimise and mitigate that affect. Applicable to small, domestic projects and large-scale industrial developments.	https://www.environment.gov.au/biodiversity/migratory-species/draft-national-light-pollution-guidelines	Australian Government Department of Environment and Energy	
Byron Bird Buddies	Byron Bird Buddies conduct regular field trip surveys throughout Byron Shire and have a comprehensive records database.	https://www.byronbirdbuddies.com.au	Byron Bird Buddies	
Bird Data	Birdata is BirdLife Australia's mobile app and web portal. It facilities simple data entry in the field and basic reporting facilities. It also provides for various dedicated monitoring projects such as Shorebirds 2020 and Birds in Backyards.	https://birdata.birdlife.org.au/	BirdLife Australia	

A review of the available planning tools conducted during development of this strategy identified a number of information gaps, summarised in Table 3.2 below. Actions to fill in these information gaps are an important element of this Strategy and are detailed in Chapter 4.

Table 3.2 Information Gaps

Dataset	Summary	Responsibility
Wildlife Corridor Mapping	Accurate local wildlife corridor mapping is critical to help direct on-ground restoration/planting priorities as well as infrastructure and planning assessments. Existing wildlife corridor mapping requires updating with regards to: • Current mapping methodologies, • Identification of key linkages and gaps in the landscape, • Alignment with corridor mapping from adjacent local government areas, • Alignment with future climate modelling scenarios.	Byron Shire Council: Biodiversity Strategy Action 1.16
Vegetation Mapping	Council's vegetation mapping will require updating with new Plant Community Types once these are available. Vegetation mapping updates will include: • Changes to the Camphor 50-80% layer identified through new PCTs, • Identification of newly listed EPBC threatened communities, e.g. Swamp Oak • Identification of all Vegetation Management Plan plantings • Identification of all areas planted since 2017 with public money and private properties that are managed for conservation, including Landcare planting sites. • Identification of planted sclerophyll vegetation. • Updating E-zone mapping with new PCTs • Updated fire interval status.	Byron Shire Council: Biodiversity Strategy Actions 1.13, 1.17, 1.18, 1.20, 4.4
Koala Habitat Mapping	Current koala habitat mapping needs to be updated with revised PCTs and new regional data from North Coast Koala Linkage Project (University of Queensland), in addition to information available via the DPIE Koala Habitat Information Base and new SEPP Koala Habitat Protection 2019.	Byron Shire Council: Biodiversity Strategy Actions 1.6, 1.19
Priority Restoration Areas	A map identifying key priority areas to in which to invest restoration effort will assist in directing future Council and community restoration activities. This map will need to include information on wildlife corridors, HEV vegetation, key threatened species habitat, existing restoration sites on public and private land, level of protection (zoning) and priority sites for mitigation of climate change impacts.	Byron Shire Council: Biodiversity Strategy Action 1.9

3.4 Stakeholder Consultation

Several phases of stakeholder consultation informed this strategy, including a community survey in 2015 (over 400 responses), plus follow up surveys, workshops and key stakeholder meetings in 2018-2019, attended by farmers, local business, environmental groups, industry professionals, interested individuals, plus representatives from Bundjalung of Byron Bay Aboriginal Corporation (Arakwal) Local Aboriginal Land Councils, NSW National Parks and Wildlife Service, Marine Parks and Council. Recent community surveys for Councils Sustainable Visitation Strategy and Community Strategic Plan also identified community trends in relation to biodiversity conservation, which have been considered during the development of this strategy. Issues raised are summarised in Table 3.3 below, and a detailed review is provided in Appendix 5.a

Case Study: Paddy's Creek Landcare – Improving Our Environment for Human and Flying Fox Residents

Paddy's Creek reserve is a small, 1.6 hectare remnant of subtropical rainforest, located in the heart of Bangalow and surrounded by houses. It is also listed as Flying-fox camp under Council's Flying-fox Camp Management Plan, and protects the banks of Paddy's Creek – a tributary of the Wilsons River.

Recent restoration works in this area undertaken by Council as part of the Camp Management Plan have coincided with the formation of the new Paddy's Creek Landcare group. This is a perfect opportunity for Council and local residents to work closely together to improve the condition of this small but important reserve, which is a much loved recreational area for the local residents and pre-school, as well as a seasonal home for endangered Grey-headed Flying Foxes.

Council has recently removed a number of invasive Camphor Laurel trees from the site, and Paddy's Creek Landcare are now working in partnership with Council's Bush Regeneration team to maintain the 1.6 hectare reserve and to extend native vegetation plantings to protect the creek bank and provide additional wildlife habitat.

Table 3.3 Current Community Trends and Issues

Trend or Issue	Implications or Opportunities
Habitat loss & fragmentation is a key threat to local biodiversity, and restoring habitat connectivity is a top priority. State biodiversity conservation legislation has weakened and Council's plans and policies must adapt to provide the level of protection required. Fragmentation of the connection between land and sea has also impacts on the traditional cultural landscape.	Restoring connectivity will require a diverse suite of management tools, including robust legislative and planning instruments, resources to manage compliance, up-to-date regional mapping and scientific information to prioritise on ground works, better partnerships for cross-tenure land and road management and incentives to build capacity on private land. There are opportunities within Council's DCP and LEP to provide better protection of local biodiversity, and to use local ecological expertise to ensure that valuable habitat is identified.
The integrity of remaining habitat is further compromised by introduced plant and animal species & domestic pets.	Management of pest plants and animals requires a well coordinated cross-tenure approach. Implementation of the actions outlined in Council's recently adopted Pest Animal Management Plan and Integrated Pest Management Strategy, as well as strengthening partnerships with local landholders, community groups and other regional government organisations will be critical to achieving this.
Climate change will have a significant impact on biodiversity, and we need to plan for this.	While much research has been done, the impact of climate change on our biodiversity is still unknown. Biodiversity planning will need to focus on improving ecosystem functioning and resilience to enable adaptation to change. Local government has an opportunity to provide leadership, for example through development and implementation of a Climate Emergency Action Plan, and through partnering with other levels of government and universities to manage biodiversity in accordance with up to date information.
Byron Shire has an abundance of active community environmental groups and individuals with a track record of achieving outstanding results. But proactive biodiversity management & sustainable agricultural practices on private property are often constrained by a lack of resources and support, and by conflicting land use practices on neighbouring properties.	The community is increasingly aware of our shared responsibility for biodiversity management and the need to work together to achieve effective results. Council has an opportunity to work with the community through innovative education, incentive and partnership programmes that encourage conservation and best practice management on private land. Partnership and cooperation with the network of community action groups in the shire, including Landcare, Dunecare, Byron Bird Buddies, Friends of the Koala and Bangalow Koalas will be central to restoring connectivity and resilience across the landscape.
People want to know how they can help. Improved education and awareness across all levels of the community, from rural land holders and land managers, to urban residents, visitors, tourism providers and Council staff is critical to protect and conserve biodiversity.	Residents and visitors need targeted information to help them appreciate, care for and conserve our native biodiversity. There is an opportunity here to communicate with people via a range of media platforms and to integrate biodiversity conservation messages into Councils general communications and marketing. Partnerships with business, industry, community groups and universities will be essential to help understand knowledge gaps and to promote and guide best practice.

Trend or Issue	Implications or Opportunities
Budjalung of Byron Bay Bay Aboriginal Corporation (Arakwal), Tweed-Byron, Jali and Ngulingah traditional owners all have significant knowledge of traditional land management practices, and a cultural landscape that is deeply integrated with our natural environment. Dialogue with these communities should be an integral part of natural area management.	Aboriginal values should be incorporated into biodiversity planning at all levels, through coordinated engagement & collaboration with relevant aboriginal stakeholders and elevation of traditional knowledge to improve community and land manager awareness. The use of aboriginal language, in reports, media communications and educational information will contribute to integration of indigenous culture in biodiversity management.

"Our Country is our spiritual being, where we are connected to! When we on Country, we are at home; we care for it, we nurture it and it nourishes us.

We want to have our people here, we want our people working and living on Country; continuing the legacy of our Elders to look after and care for what is so important to us."

Directors of the Bundjalung of Byron Bay Aboriginal Corporation, Arakwal (2019).

Artist: Nigel Stewart

Chapter 4 – Strategic Framework and Action Plan

What we are going to do

This part of the strategy outlines **what** Council wants to do to protect and enhance our biodiversity (our aims), and **how** we intend to do it (our objectives). This chapter also includes a detailed **Action Plan** – a comprehensive list of specific, prioritised actions that Council intends to undertake to achieve its biodiversity aims over the next decade.

Our aims and objectives have been identified through:

- Review of our current knowledge of local biodiversity values (Chapter 1) and threats to those values (Chapter 2).
- Review of national, state and regional policies and strategies for Biodiversity (Chapter 3)
- Community and expert stakeholder consultation (Chapter 3 and Appendix 5).
- Review of Council's 2004 Biodiversity Conservation Strategy.

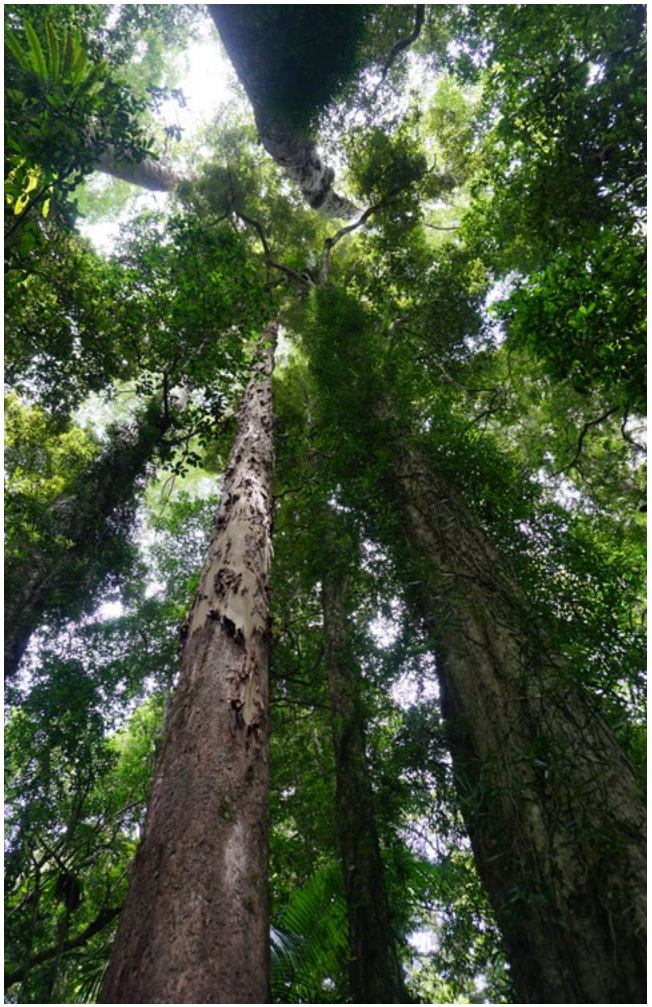
Australia's Biodiversity Conservation Strategy 2010-2030 acknowledges that Australians, as a society and individuals, must act collectively to reduce our environmental footprint and protect our native species and ecosystems. Our actions impact on biodiversity every day and all of us – government, non-government organisations, businesses, private landholders, indigenous peoples and the public – must take responsibility for biodiversity conservation.

Stakeholders indicated strong support for our collective responsibility, but also the need for **leadership** from government. The community want **information** on what they can do to protect native wildlife. Landholders want **support** to improve the ecological health and sustainability of their properties. And other local and regional organisations are willing to partner with local government to **manage** habitat connectivity and resilience at a landscape scale.

Council's role is therefore one of leadership and management, as well as education and support. The Biodiversity Conservation Strategy has been developed to align with these four aims, to **Lead, Manage, Inform** and **Support,** in order to address all the ways in which Council can work with the community to meet our biodiversity conservation responsibilities.

Many of the proposed actions will ultimately meet more than one aim. The nature of biodiversity means that most issues are interrelated: action in one area creates impact across each of the others. Recognising these interrelationships encourages us to come together to work towards shared goals.

Red Apple, H. Bower



Subtropical Rainforest, L. Caddick

AIM 1 - Lead

We are an organisation that provides clear direction, guidance and resources to conserve and enhance our biodiversity

While 43% of land in Byron Shire is mapped as High Environmental Value (HEV – Box 3), National Parks and Reserves only cover 17% the shire. This means that there is a large amount of remnant vegetation on private land that provides critical wildlife habitat and stepping stones to larger forested areas, protects our water quality and soils, and mitigates the impacts of climate change.

Ensuring that our local government planning instruments maximise opportunities to protect and enhance HEV land is essential to reverse ecological decline. A significant step towards this will be development of a new Biodiversity DCP that reflects current legislation and incorporates clear planning guidelines to protect wildlife habitat and mitigate development impacts on biodiversity.

To protect our HEV land we need to have an accurate picture of where it is. Investment in our Geographic Information Systems (GIS), including mapping local wildlife corridors and identifying priority restoration areas will help Council to prioritise on-ground conservation activities. Council also aims to make this data accessible on-line, to help the community plan and prioritise on-ground land management.

Council's development of a Climate Change Adaptation Plan will also present opportunities to maximise biodiversity conservation outcomes, including restoration of degraded land, protection of vulnerable coastal and wetland ecosystems and protection of future wildlife corridors to improve resilience to environmental change.

Adequate resourcing will be essential to achieve our biodiversity actions. Council will continue to fund biodiversity planning and on-ground management through general revenue, as well as seeking grant funding for projects identified in the Action Plan.

Swamp Orchid, L. Caddick

Leadership Objectives

1.1 Council's land use planning decision-making processes are up to date with current legislation and maximise opportunities to protect HEV landscapes.

1.2 Climate change adaptation strategies consider and maximise opportunities for biodiversity conservation.

1.3 Council uses current best practice desktop tools to support and facilitate High Environmental Value landscape and habitat protection.

1.4 Biodiversity conservation and management principles are better integrated into Council's day-to-day operations.

1.5 Additional is funding secured to support biodiversity projects.

Key Partners

- NSW Department of Planning, Industry and Environment
- Other Northern Rivers Councils
- Biodiversity Conservation Trust
- Private landholders
- NRJO NRM Managers Group
- Local ecological experts and community groups.

AIM 2: Inform

Our community is well informed about biodiversity and what they can do to protect it.

Byron Shire residents care about our natural environment, and many are highly skilled in biodiversity conservation. Our environmental volunteers include over 650 people, contributing more than 37,000 hours per year to help protect and restore our environment. Many people want to know more about what they can do to help our native wildlife. These groups need up-to-date, accessible information on best practices and products, so that they can take ownership of and drive effective biodiversity outcomes. However, with a population growth rate above that in most regional centres and over two million visitors a year, our shire also has a new - and constantly changing – population.

Council has a responsibility to engage better with both our residents and visitors, to help them understand our unique environment and how they can help protect it. We hope to achieve this through working with local groups and events, to engage a broader sector of the community, and gain greater understanding of what moves and motivates different people to protect biodiversity. Opportunities to engage with the community include social media, printed material, workshops, artwork, activities and events, and Council needs to look at all available awareness-raising options to maximise our outreach.

Working in parallel with Councils Sustainable Visitation Strategy, there are also opportunities for Council to engage with the tourism industry to help focus product development in nature-based tourism – creating visitor experiences that allow people to contribute, make a difference and be immersed in the conservation process.

Central to a well-informed community, is the information held by Aboriginal Australians relating to our natural environment. Biodiversity is an integrated part of the cultural landscape of indigenous Australians. Incorporating local Bundjalung language and stories into our environmental messages will engage visitors and locals with our cultural heritage, as well as building awareness around local culturally important species and their importance in ecosystem management.

Totems

Totems are natural objects and creatures that connect Aboriginal Australians to country, and to their responsibility for Country. Totems may not be rare species, but they are important in our environment, and can help us learn about it and how it is changing. When we look after culturally important species, we are looking after the whole landscape.

The totem for the Arakwal clan is Gabul, the carpet snake. Wajung, the dolphin, is the Arakwal women's totem, and the men's totem is Miwing, the sea eagle.

Artist: Daniel Hend

Information Objectives

2.1 The community has access to clear, up to date information on Byron Shires unique biodiversity and how everyone can help protect it.

2.2 Land managers and residents are provided with accessible information regarding threats to native biodiversity and their individual responsibility to manage these threats.

2.3 Council facilitates opportunities for visitors to engage with nature and to learn about and want to protect Byron Shire's biodiversity.

2.4 Information on our local indigenous heritage is integrated into education and information materials developed for residents and visitors.

Key Partners

- Byron Shire residents
- Landcare
- Friends of the Koala
- Bangalow Koalas
- WIRES and Northern Rivers Wildlife Carers
- Council Economic Development and Sustainability team
- Bundjalung of Byron Bay Aboriginal Corporation (Arakwal)
- Tweed-Byron Local Aboriginal Land Council
- Byron Bird Buddies
- Jali Local Aboriginal Land Council
- Ngulingah Local Aboriginal Land Council
- Tourism providers
- Local schools

AIM 3: Support

Our land managers are well supported to conserve biodiversity across the landscape

Reinstating a strategic network of native vegetation is essential to maintain functional ecosystems that are resilient to climate change. To achieve real results across the landscape, Council must support and partner with other land managers in the region, including private landholders, community groups and government agencies.

With nearly 70% of the shire classified as agricultural, forestry and quarries (Rural Lands Strategy, 2012), participation of private landholders will be critical to re-establishing ecological corridors. Many private landholders are already restoring habitat and managing pest species on their properties, often with the support of Landcare. Whether their main focus is habitat restoration, agriculture or other rural industries, Council can improve the capacity of landholders to enhance habitat connectivity, through providing information, support, incentives and strategic direction.

Over the next decade, private land managers are also likely to participate in the carbon offsets industry, through Federal Government emissions reduction schemes including tree planting, ecological restoration and increasing soil carbon storage. Council will work with other local landholders and groups to help facilitate integration of biodiversity conservation into local offsetting programs.

Aboriginal Australians have a cultural system in which social, political, religious, land and environmental elements are closely integrated. This interdependence between the environment and other aspects of indigenous culture gives land custodianship particular significance to Aboriginal Australians and creates capacity to develop innovative management practices. Consultation with Bundjalung of Byron Bay Aboriginal Corporation (Arakwal) and land councils regarding management of significant Aboriginal places in the Shire, as well as more broadly on biodiversity issues, will enable Council to adopt a more comprehensive approach to biodiversity conservation, and also to recognise and respect customary laws and practices in our approach to land management.

Support Objectives

3.1 Council develops strong partnerships with relevant Aboriginal stakeholders, that share biodiversity knowledge and guide management.

3.2 Council works positively and proactively with rural landholders to facilitate biodiversity restoration and conservation on private land.

3.3 Council supports and facilitates a local carbon offsets industry that integrates biodiversity conservation into planning and design of offset plantings.

Key Partners

- Private landholders and leaseholders
- Land for Wildlife
- Community conservation groups including Landcare, Zero Emissions Byron, Byron Bird Buddies, Bangalow Koalas, Friends of the Koala
- Environment Trust
- Biodiversity Conservation Trust
- Local Land Services
- Rous County Council
- Northern Rivers Fire and Biodiversity Consortium
- Bundjalung of Byron Bay Aboriginal Corporation (Arakwal)
- Tweed-Byron Local Aboriginal Land Corporation
- Jali Local Aboriginal Land Corporation
- Ngulingah Local Aboriginal Land Corporation
- Madhima Gulgan Community Association
- NRJO NRM Managers Group

AIM 4: Manage

We use best practice land management to improve ecological resilience and reduce threats to biodiversity

Since 2004, Council's ecological restoration team has begun restoration of over 200 hectares of Council land. Over the next decade Council will continue to invest in restoring the remaining 400 hectares, using ongoing monitoring to inform and prioritise restoration planning.

In a changing climate, it will be vital for Council to continue to partner with universities, Government agencies and other land managers to share knowledge, in relation to plant species selection, fire management, disease and shifts in habitat and behaviour of threatened species. Input from local Aboriginal land managers will enable Council to benefit from unique knowledge, specific to this cultural landscape, as well as helping Aboriginal communities to keep their connection to Country.

Best practice weed and pest animal management actions are identified in Council's Integrated Pest Management Strategy and Pest Animal Management Plan. Council will continue to implement these plans, using an integrated pest management approach and partnership with landholders and neighbouring councils to address threats at a landscape scale.

Council is committed to ensuring no net loss of biodiversity in its developments, through avoidance of biodiversity impacts where possible and offsetting impacts where no other option is available.

Council manages a road network of over 600km, which impacts on our local biodiversity. Council will seek to mitigate wildlife trauma on our roads through identification and management of hot spots, and seeking ways to better engage our road users.
Our creeks and rivers are central to the biodiversity of Byron Shire, as well as the neighbouring regions that share our catchments. Projects such as Bringing Back the Bruns will help to prioritise restoration efforts along our waterways, and Council will continue to seek opportunities to reduce erosion, reduce road barriers and facilitate fish passage and in-stream connectivity as part of our infrastructure asset replacement program.

Management Objectives

4.1 Provide ongoing resources for the bush regeneration team to restore degraded native vegetation on Council-managed land.

4.2 Partner with community groups, universities and citizen scientists to monitor threatened species to improve best-practice management.

4.3 Engage with local and regional stakeholders to ensure land managers are aware of and implementing current best practice in biodiversity and cultural heritage management.

4.4 Implement existing threatened species management plans on Council-managed land.

4.5 Weeds are monitored, mapped and recorded to prioritise management across the Shire.

4.6 Pest animals are managed strategically through targeted management plans.

4.7 Investigate and implement opportunities to protect native wildlife on Council-managed roads.

4.8 Encourage and provide support to Landcare, Primary Industry groups and landholders to implement natural resource management along local waterways.

Key Partners

- Universities
- Other Northern Rivers Councils
- Northern Rivers Fire and Biodiversity Consortium
- Firesticks Alliance
- NRJO NRM Managers Group
- Bundjalung of Byron Bay Aboriginal Corporation (Arakwal)
- Jali, Tweed-Byron and Ngulingah Local Aboriginal Land Councils
- Byron Bird Buddies
- NSW Roads and Maritime Services
- Flying Fox Project Reference Group
- Regional Koala Communications Group

Action Plan

How to read this Action Plan

All actions have been prioritised. Council aims to initiate Very High (VH) priorities within 1-2 years of adoption of the Strategy, High (H) priorities within 3 years of the adoption of the Strategy, Medium (M) priorities within 5 years of adoption of the Strategy and Low (L) priorities within the Strategy 10 year timeframe.

The Lead column indicates which Council directorate will take the lead on this Action under Council's Operational Plan. SEE stands for Sustainable Environment and Economy Directorate. IS stands for Infrastructure Services Directorate.

This Action Plan will be reviewed annually. Some actions and priorities may change over the lifetime of the Strategy, in accordance with new legislation and policy, current research and funding opportunities. Proposed changes will be reviewed by Council's Biodiversity Advisory Committee.

1. LEAD: An organisation that provides clear direction, guidance and resources to conserve and enhance our biodiversity

Objective	No.	Action	Priority	Resources	Lead	Performance indicator
1.1 Council's land use planning decision-making processes are up to date with current legislation and maximise opportunities to protect HEV landscapes.	1.1	Update Council's DCP 2014 to include a Biodiversity, Vegetation and Habitat Management Chapter that: • Reflects current legislation; • Aligns with the Byron Shire Rural Land Use Strategy 2017. • Reflects updates to local and regional vegetation mapping; • Provides standards and controls to ensure planning of new development maintains or improves ecological values & ecological function; • Incorporates clear planning controls for protection of Koala Habitat, within the Byron Coastal Koala Management Area, and other rural koalas habitat areas. • Aligns with the Guiding Principles of this Biodiversity Conservation Strategy.	VH	$20,000	Council SEE Directorate	Biodiversity DCP adopted and in use.
	1.2	Amend existing Council DCP chapters to reflect current NSW environmental legislation and Council's Biodiversity DCP chapter.	VH	In house	Council SEE Directorate	DCP updated to refer to 2016 Biodiversity Conservation Act and Council's Biodiversity DCP

Objective	No.	Action	Priority	Resources	Lead	Performance indicator
	1.3	Review opportunities to improve biodiversity through tree planting/ restoration provisions in Council's urban and rural development approval processes.	H	$7,000	Council SEE Directorate	DCP chapters B2, D2 and D3 updated with clear guidelines for offset planting, on-site planting ratios and restoration opportunities.
	1.4	Work with other Northern Rivers council's to investigate opportunities to reduce the risk of Biodiversity Credits being used to export biodiversity values to other regions.	M	In house	Council SEE Directorate	Report to Biodiversity Advisory Committee
	1.5	Amend Council's LEP to increase protections for core koala habitat as per CKPOM.	H	In house	Council SEE Directorate	LEP includes specific reference to protection of Core Koala Habitat.
	1.6	Review and ratify the Byron Coast Comprehensive Koala Plan of Management.	H	$3,000	Council SEE Directorate	Byron Coast CKPOM ratified by NSW Department of Planning.
	1.7	Develop a Comprehensive Koala Plan of Management for Byron Shire Hinterland, in accordance with SEPP (Koala Habitat Protection) 2019.	H	$40,000	Council SEE Directorate	Byron Hinterland CKPOM adopted by Council. Byron Hinterland CKPOM ratified by NSW Department of Planning.
1.2 Climate change adaptation strategies consider and maximise opportunities for biodiversity conservation.	1.8	Support development of Byron Shire Climate Change Adaptation Plan and integration of biodiversity conservation actions into this plan, including: • Investigating the impacts of climate change on local biodiversity; • identification and protection of wildlife corridors and refugia; • identification and protection of high carbon storage ecosystems and buffers for climate change adaptation	M	Implemented via Byron Shire Climate Emergency Action Plan	Council SEE Directorate	Climate Emergency Action Plan reviewed by Biodiversity Officer.
	1.9	Update Council planting lists to identify species in different vegetation communities likely to be adaptable or sensitive to climate change, and effective in carbon sequestration	H	In house	Council SEE Directorate	Updated planting lists available on Council website

Objective	No.	Action	Priority	Resources	Lead	Performance indicator
1.3 Council uses current best practice desktop tools to support and facilitate HEV landscape and habitat protection.	1.10	Develop a priority restoration investment map that identifies key sites on private and public land requiring either protection or restoration, to assist in directing future Council and community restoration activities.	H/M	$15,000	Council SEE Directorate	Priority investment map available on Council GIS, and accessible to community conservation groups.
	1.11	Conduct a review of Byron Shire's biodiversity values as a baseline for ongoing biodiversity monitoring. Include: • Updated Byron Shire flora and fauna lists, • Status of threatened flora and fauna, • Status of weed species, • Extent of native vegetation, • Extent of protected vegetation (public and private land) • Fire frequency status	V/H	$10,000	Council SEE Directorate	Baseline species lists and vegetation maps uploaded to Council website.
	1.12	Update Council's threatened species mapping to reflect local, state and federal mapping.	O	In house	Council SEE Directorate	DPIE threatened species data uploaded annually to Council's GIS. Mapping updated as required and reported to Biodiversity Advisory Committee
	1.13	Upload Council's threatened species records to Bionet annually.	O	In house	Council SEE Directorate	Council threatened species records uploaded annually to Bionet.
	1.14	Update and maintain Council's vegetation and HEV mapping with revised Plant Community Types (PCTs) and current aerial photography.	H	$8,000	Council SEE Directorate	Council vegetation mapping updated with new PCT data.
	1.15	Map 1750 vegetation formations as a baseline for ecological restoration.	M	$5000	Council SEE Directorate	1750 vegetation formations mapped.
	1.16	Review procedure for updating Council's vegetation mapping following on ground ecological assessments/site visits.	M	In house	Council SEE Directorate	Methodology for mapping site-based ecological data reviewed and implemented.
	1.17	Develop a process for Council field staff to update Council's GIS mapping with threatened species records on site.	M	In house	Council SEE Directorate	Field staff trained in use of application to upload threatened species records to Council GIS.
	1.18	Update Council's wildlife corridor mapping and liaise with other NRJO Councils to ensure consistency in wildlife corridor mapping across the region.	VH	$40,000	Council SEE Directorate	Corridor mapping available on Council GIS.Corridor mapping included as a red flag in Biodiversity DCP.

Objective	No.	Action	Priority	Resources	Lead	Performance indicator
	1.19	Update vegetation mapping to clearly identify recently listed threatened ecological communities e.g. Coastal Swamp Oak *(Casuarina glauca)* Woodland.	H	In house	Council SEE Directorate	All threatened ecological communities identified on Council vegetation mapping.
	1.20	Map areas that have been revegetated: a) using public funds, and b) for conservation purposes	H	$3,000	Council SEE Directorate	GIS map layer identifying areas revegetated using public funds developed and maintained. Map supplied to Local Land Services offices.
	1.21	Monitor the extent of native vegetation cover in Byron Shire every 3 years.	M	In house	Council SEE Directorate	Extent of native vegetation cover included in State of Environment Reporting.
	1.22	Update Council's Koala Potential Habitat mapping to reflect new PCTs and emerging datasets from DPIE (Koala Habitat Information Base) and UQ (North Coast Koala Linkage Project).	H	$20,000	Council SEE Directorate	Koala Potential Habitat map layer reflects up to date NSW vegetation mapping.
	1.23	Develop a process for recording and mapping areas covered by Vegetation Management Plans on private land.	M	In house	Council SEE Directorate	New and recent VMPs added to Council's GIS.
	1.24	Make Council's roadside threatened flora mapping available to council outdoor staff, contractors and the community via mobile application and public facing webmap viewer.	M	Implemented via Integrated Pest Management Strategy	Council IS Directorate	Refer Integrated Pest Management Strategy
	1.25	Map potential habitat areas for Mitchell's Rainforest Snail.	M	$10,000	Council IS Directorate	Mitchell's Rainforest Snail habitat mapped on Council GIS.
	1.26	Promote use of mobile data collection applications, such as Feral Scan and I Spy Koala, to enable the community to participate in biodiversity-related data collection.	M	In house	Council SEE Directorate	New mobile data collection applications reviewed and linked to Council's website where relevant.
	1.27	Investigate the need for and benefits of a significant tree register.	L	In house	Council SEE Directorate	Findings reported to Biodiversity Advisory Committee

Objective	No.	Action	Priority	Resources	Lead	Performance indicator
1.4 Biodiversity conservation and management principles are better integrated into Council's day-to-day operations.	1.28	Develop and integrate a biodiversity management checklist into Council's Pulse project management program for all Council projects.	M	In house	Council SEE Directorate	Biodiversity checklist in Pulse
	1.29	Ensure that Council's infrastucture planning map layers are kept up to date with current ecological data sets to inform infrastructure design and planning.	O	In house	Council SEE Directorate	CRA and REF layers reviewed and updated as required.
	1.30	Continue development of Coastal Management Programs for the Shire's coastline and estuaries, ensuring CMPs are consistent with the intent of this Biodiversity Strategy.	M	Implemented under Coastal Management Plans	Council SEE Directorate	Refer Council Coastal Management Plans
1.5 Additional funding is secured to support biodiversity projects.	1.31	Review Council's funding framework for biodiversity projects, including Environmental Levy Implementation Policy.	L	In house	Council SEE Directorate	Biodiversity funding framework options reported to Biodiversity Advisory Committee.
	1.32	Work with Council's Grants Officer to identify funding opportunities available to deliver elements of this plan on both private and public land.	O	In house	Council SEE Directorate	Grant funding secured annually for Biodiversity Conservation Strategy projects.
	1.33	Incorporate relevant elements of this strategy (e.g. relating to coastal wetlands, littoral rainforest) into Council's Coastal Management Programs, to increase potential for funding support through the State Government Coastal and Estuary Grants Program.	M	Implemented under Coastal Management Plans	Council SEE Directorate	Refer Council Coastal Management Plans

2. INFORM: A community that is well informed about biodiversity and what they can do to protect it

Objective	No.	Action	Priority	Resources	Lead	Performance indicator
2.1 The community has access to clear, up to date information on Byron Shires unique biodiversity and how everyone can help protect it.	2.1	Provide expert advice regarding how people can help protect biodiversity, including: - Simple steps people can take to reduce their climate footprint. - How to improve biodiversity of urban areas and villages. - How to protect native wildlife from threats. - Information on the Shire's most threatened species	H	In house	Council SEE Directorate	Council environment web pages reviewed and updated annually. 4 x social media posts per year relating to protecting biodiversity and/or managing threats to biodiversity.
	2.2	Use Council's website to promote existing local biodiversity information resources that are available via Council front Counter, including: - Tweed-Byron Native Species Planting Guide - My Local Native Garden book - Weeds of the North Coast of NSW identification guide - Wildlife posters.	H	In house	Council SEE Directorate	Website updated to list publications available. Update promoted via social media.
	2.3	Update existing Brunswick Catchment Riparian Planting Guide and make available on-line.	M	$4,000	Council SEE Directorate	Revised Riparian Planting Guide on Council's website.
	2.4	Implement Flying Fox information and awareness program	H	Implemented under Flying Fox Camp Management Plan	Council SEE Directorate	Refer Flying Fox Camp Management Plan
	2.5	Raise community awareness of how planned fire in open forest ecosystems can help conserve biodiversity, re-invigorate Aboriginal cultural practices, improve community bush fire safety and reduce green house gas emissions.	M	$2,500	Council SEE Directorate	Council website updated with information on fire ecology in Byron Shire. Community workshop on fire ecology.
	2.6	Implement a community awareness campaign to assist in protection and habitat identification for the Mitchell's Rainforest Snail in the Byron Bay area.	M	$8,000	Council IS Directorate	Community awareness campaign implemented.
	2.7	Support and promote local biodiversity-related events and citizen science initiatives.	O	$1,000/ year	Council SEE Directorate	Community biodiversity and conservation events promoted via Council media platforms as required.

Objective	No.	Action	Priority	Resources	Lead	Performance indicator
2.2 Land managers and residents are provided with accessible information regarding threats to native biodiversity and their individual responsibility to manage these threats.	2.8	Develop and implement a Pest Management Education and Awareness Plan for target pest animal species in Byron Shire.	H	Implemented under Pest Animal Management Plan	Council SEE Directorate	Refer Pest Animal Management Plan
	2.9	Facilitate opportunities for information sharing regarding weeds and weed management, for example through supporting/promoting and staff attendance at local Landcare and Rous County Council workshops and field days.	O	Implemented under Integrated Pest Management Strategy	Council IS Directorate	Refer Integrated Pest Management Strategy
	2.10	Keep the community informed of the Shire's 'worst weeds' via Council's website.	M	Implemented under Integrated Pest Management Strategy	Council IS Directorate	Refer Integrated Pest Management Strategy
	2.11	Inform the community of impacts of dumping green waste/rubbish in bushland, & promote use of green waste bins.	O	Implemented under Integrated Pest Management Strategy	Council IS Directorate	Refer Integrated Pest Management Strategy
	2.12	Develop an education and awareness program regarding managing the impacts of domestic animals on native wildlife.	M	$25,000	Council SEE Directorate	Council website updated. Social media posts. Pet-owner awareness event delivered.
2.3 Council facilitates opportunities for visitors to engage with nature and to learn about and want to protect Byron Shire's biodiversity.	2.13	Seek opportunities to work with tourism operators to build capacity in environmental awareness, e.g. through: - Identifying industry needs - Developing clear, simple messaging - Identifying effective means to deliver key messages.	M	$15,000	Council SEE Directorate	Tourism industry representatives engaged to identify key needs and information gaps. Council website updated with key information resources for tourism providers. Information session for tourism providers.
	2.14	Seek funding for design and fabrication of engaging interpretive information regarding native wildlife at locations receiving high visitor numbers.	M	$10,000	Council SEE Directorate	Funding for signs sourced and interpretive signs installed at key locations.

Objective	No.	Action	Priority	Resources	Lead	Performance indicator
	2.15	Support opportunities for incorporation of environmental awareness raising activities at events.	O	In house	Council SEE Directorate	Attendance of Council environmental officers at events.
	2.16	Partner with Council Tourism Officers to investigate opportunities for development of a volunteer tourism initiative that links environmental community groups with visitors.	L	In house	Council SEE Directorate	Review of volunteer tourism options available in Byron Shire.
2.4 Information on our local indigenous heritage is integrated into education and information materials developed for residents and visitors.	2.17	In consultation with Bundjalung of Byron Bay Aboriginal Corporation (Arakwal), increase inclusion of known Bundjalung language for place, plants and animals in Council biodiversity documents and outputs.	M	In house	Council SEE Directorate	Interpretive signs (Action 2.14) incorporate Bundjalung language. Environmental messaging for visitors and tourism providers (Action 2.13) incorporates Bundjalung language where relevant.

Brunswick River, L. Caddick

3. SUPPORT: Our land managers are well supported to maximise biodiversity conservation across the landscape

Objective	No.	Action	Priority	Resources	Lead	Performance indicator
3.1 Council develops strong partnerships with relevant Aboriginal stakeholders, that share biodiversity knowledge and guide management.	3.1	Work with relevant aboriginal stakeholders to identify triggers for consultation with these groups on biodiversity issues, and to integrate these into Council's day-to-day operations.	M	In house	Council SEE Directorate	Aboriginal cultural heritage triggers identified and uploaded to promapp system.
	3.2	Where identified through Action 3.1, consult local relevant aboriginal stakeholders regarding input of traditional knowledge into biodiversity plans, strategies and projects.	O	In house	Council SEE Directorate	Ongoing consultation as required.
3.2 Council works positively and proactively with rural landholders to facilitate biodiversity restoration and conservation on private land.	3.3	Investigate increasing the level of extension services currently provided by Brunswick Valley Landcare to provide greater support to individuals wanting to improve biodiversity values on private property.	H	$16,000/ year	Council SEE Directorate	Report to Council
	3.4	Develop a web page that connects rural landholders to biodiversity management resources for rural properties.	M	In house	Council SEE Directorate	Rural landholders biodiversity web page developed.
	3.5	Make the following Council vegetation mapping layers available to the public to assist with restoration planning: - Wildlife corridors - HEV Vegetation - Threatened species - Vegetation mapping - Priority restoration areas	H	In house	Council SEE Directorate	Council vegetation mapping layers available via Council's website.
	3.6	Compile a database of: - landholders interested in or participating in active restoration and - landholders of sites identified as high priority for conservation/ restoration (Action 1.9).	H	In house	Council SEE Directorate	Landholder database created.
	3.7	Engage with landholders listed above (Action 3.4) to: a) advise of available land management resources, training, and incentives. b) advise of funding opportunities available for restoration, including grants and Biodiversity Stewardship Agreements.	M	In house	Council SEE Directorate	Information regarding: a) available resources and b) funding opportunities provided to landholders identified in Action 3.4.
	3.8	Work with neighbouring Councils and Friends of the Koala to Implement NE Hinterland Koala Conservation Project to increase planted koala habitat and secure conservation agreements for koala habitat on private land in Byron Shire.	H	$72,000	Council SEE Directorate	2.8 Ha koala habitat planted by 2022.
	3.9	Seek grant funding opportunities for combined Council-private landholder restoration and revegetation projects on private land.	M	In house	Council SEE Directorate	Funding secured for restoration projects on private land.

Objective	No.	Action	Priority	Resources	Lead	Performance indicator
	3.10	Support and promote existing landholder incentive programmes.	H	$16,500	Council SEE Directorate	Landcare Officer position hosted by Byron Shire Council. Managing Land in the Micro Climate of Byron Shire project delivered. Byron Habitat Corridors and Mooiball Spur Corridor Restoration Project delivered.
	3.11	Partner with Landcare to deliver annual/bi-annual training sessions for landowners on native vegetation restoration.	M	$2,500	Council SEE Directorate	Two training sessions delivered per year in partnership with Brunswick Valley Landcare.
	3.12	Continue to facilitate Agricultural Cluster Group to identify opportunities for sustainable farming improvements.	O	In house	Council SEE Directorate	Agricultural Cluster Group meetings attended ongoing
	3.13	Investigate opportunities for Council to provide incentives for landholders to conduct restoration works that will assist with long term biodiversity conservation.	H	In house	Council SEE Directorate	Landholder incentive options reviewed and reported to Biodiversity Advisory Committee.
	3.14	Seek grant funding for an extension officer to work with landholders to protect and enhance biodiversity values on private land.	M	$150,000	Council SEE Directorate	Grant proposal submitted to relevant authority.
3.3 Council supports and facilitates a local carbon offsets industry that integrates biodiversity conservation into planning and design of offset plantings.	3.15	Council conservation, land management and sustainability teams work collaboratively with private land managers to establish local carbon offsets that maximise biodiversity outcomes.	M	In house	Council SEE Directorate	Local carbon offsets established.

Subtropical Rainforest Minyon Falls, L. Caddick

West Byron Wetlands, J. Olley

Grey Headed Flying Fox, V. Jones

4. MANAGE: We use best-practice land management to improve ecological resilience and reduce threats to biodiversity						
Objective	**No.**	**Action**	**Priority**	**Resources**	**Lead**	**Performance indicator**
4.1 Provide ongoing resources for the bush regeneration team to continue to implement and grow their work programme, restoring degraded native vegetation on Council-managed land.	4.1	Progress restoration of remaining Council-managed sites identified as requiring restoration to an on-maintenance level (total 307 Ha requiring restoration) and provide follow-up quarterly maintenance on all restored sites.	H	$200,000/ year	Council IS Directorate	50% of total area restored to on-maintenance level by 2030. All on-maintenance sites maintained quarterly.
	4.2	Restore (192 Ha) and maintain (315 Ha) native vegetation communities at Council Sewage Treatment Facility sites.	H	$180,000/ year	Council IS Directorate	Area restored to on-maintenance level.
	4.3	Seek additional grant funding for the implementation of on-ground ecological restoration actions at priority Council-managed sites, including wildlife corridors, koala habitat and HEV vegetation.	O	In house	Council IS & SEE Directorates	Value of grant funding awarded.
	4.4	Identify priority open forest ecosystems requiring restoration through the reintroduction of fire.	H	$4,000	Council SEE Directorate	Priority ecological burn sites identified.
	4.5	Implement a regular forum to upskill Council bush regeneration and environmental planning staff (and Landcare members) with current best practice ecological information.	M	$2,500/year	Council SEE Directorate	Annual forum held
4.2 Partner with community environmental groups, universities, citizen scientists and other land managers to monitor threatened species and ecological communities to improve best-practice biodiversity planning and management across the Northern Rivers.	4.6	Seek grant funding for baseline study of koala populations in Site Investigation Area for Koala Plans of Management that is west of the coastal Koala Plan of Management area.	H	$100,000	Council SEE Directorate	Koala populations mapped in Site Investigation Area west of Coastal Koala Plan of Management area.
	4.7	Implement a monitoring program for the Byron Coast koala population.	H	Implemented under Koala Plan of Management	Council SEE Directorate	Refer Koala Plan of Management
	4.8	Continue to partner with University of Queensland regarding koala research and management projects in Northern NSW to help direct future management, including - North Coast Koala Linkage and - Maximising outcomes for koalas on private land project.	O	In house	Council SEE Directorate	Attendance at North Coast Linkage project meetings and workshops.
	4.9	Review and implement monitoring programs to assess effectiveness of Council ecological restoration, including: - Threatened flora monitoring, - Plant species diversity, - Koala activity in planted koala corridors.	M	$5,000/ year	Council SEE Directorate	Monitoring program developed and implemented at koala habitat planting sites; Monitoring program developed and implemented at Council restoration sites.

Objective	No.	Action	Priority	Resources	Lead	Performance indicator
	4.10	Partner with local universities to undertake review of Council restoration data, including site work records and pre and post restoration species lists, to guide ongoing management and resourcing.	L	$10,000	Council SEE Directorate	Restoration monitoring review completed.
	4.11	Support expert wildlife surveys at Byron and Vallances Rd Sewerage Treatment Plants	M	$5,000/ year	Council IS Directorate	Survey program developed and implemented.
4.3 Engage with other local and regional stakeholders and advisory groups to ensure land managers are aware of and implementing current best practice in biodiversity and cultural heritage management.	4.12	Ensure Council is represented at Northern Rivers FABCON meetings and workshops to maintain currency regarding best fire management practice under changing climate.	O	In house	Council SEE Directorate	FABCON meetings attended.
	4.13	Liaise with local conservation groups and government agencies to share information (e.g. monitoring data) and identify opportunities for biodiversity conservation partnerships.	O	In house	Council SEE Directorate	Attend Regional Koala Communications Group Meetings. Attend Regional Shorebird Group Meetings. Meeting minutes reported to Biodiversity Advisory Committee.
	4.14	Involve relevant aboriginal stakeholders in development of biodiversity plans and programmes so that traditional knowledge (e.g. relating to cultural burning, plant uses, plant propagation and culturally significant species) can be effectively incorporated.	O	In house	Council SEE Directorate	Relevant stakeholders included in Stakeholder engagement for Biodiversity plans and projects
	4.15	Seek to partner with landholders, relevant Aboriginal stakeholders, universities and government fire management agencies to plan, implement and monitor an ecological and cultural burning hub at Broken Head Reserve Rd, to improve biodiversity values, provide on-ground training in ecological and cultural burning and provide data into effectiveness and best practice for biodiversity and fire management.	M	In house	Council SEE Directorate	Ecological-cultural burning hub project investigated.
	4.16	Continue Council representation at NRJO Natural Resource Managers Group.	O	In house	Council SEE Directorate	NRJO NRM Group meetings attended
	4.17	Continue to facilitate Flying Fox Project Reference Group to advise the community and seek community input regarding flying fox management.	O	In house	Council SEE Directorate	Quarterly Flying Fox Project Reference Group meetings coordinated.
4.4 Implement existing threatened species management plans on Council-managed land	4.18	Implement actions in the Flying Fox Camp Management Plan 2018-2023.	H-M	Implemented under Flying Fox Camp Management Plan	Council SEE Directorate	Refer Flying Fox Camp Management Plan

Objective	No.	Action	Priority	Resources	Lead	Performance indicator
	4.19	Implement recommendations of Council's Roadside Vegetation Management Plan during road maintenance operations including: - Seek solutions to protect threatened vegetation while also achieving safety and asset protection requirements. - Seek opportunities to coordinate road maintenance activities so as to minimise seed set and weed spread. - Develop levels of service for RVMP categories.	M	Implemented under Integrated Pest Management Strategy	Council IS Directorate	Refer Integrated Pest Management Strategy
4.5 Weeds are monitored, mapped and recorded to prioritise management across the Shire.	4.20	Map weeds of national significance and serious environmental weeds on Council Managed Land.	H	Implemented under Integrated Pest Management Strategy	Council IS Directorate	Refer Integrated Pest Management Strategy
	4.21	Ensure a coordinated approach to Bitou Bush Management on the North Coast through: - Ongoing representation of BSC at the Bitou Bush Biosecurity Zone Group, - Ongoing maintenance of Bitou Bush at Council Sites.	M	In house	Council IS Directorate	Attendance at Bitou Bush Biosecurity Zone Group meetings.
4.6 Pest animals are managed strategically through targeted management plans.	4.22	Develop and implement Operational Plans for target pest species.	H	Implemented under Pest Animal Management Plan	Council SEE Directorate	Refer Pest Animal Management Plan
	4.23	Work with North Coast LLS and private land managers to: - develop a coordinated cross-tenure approach to pest animal management, and - support management of target pest animal species on private land in high priority areas.	H	Implemented under Pest Animal Management Plan	Council SEE Directorate	Refer Pest Animal Management Plan
	4.24	Support programs researching more effective and efficient pest animal control methods.	L/M	In house	Council SEE Directorate	Council staff attendance at conferences/workshops relating to best practice pest animal management.

Objective	No.	Action	Priority	Resources	Lead	Performance indicator
4.7 Investigate and implement opportunities to protect native wildlife on Council-managed roads and infrastructure.	4.25	Work with RMS, local wildlife groups and Regional Koala Communications Group to identify road strike hotspots in Byron Shire.	H	In house	Council SEE Directorate	Current wildlife road strike hotspots identified.
	4.26	Seek funding for road strike mitigation trials at priority road strike hotspots.	M	$100,000	Council SEE & IS Directorates	Grant funding received to trial best practice road strike mitigation measures at 3 sites within the Shire.
	4.27	Consider roadkill mitigation measures and opportunities to improve wildlife connectivity into design work for new roads and road asset upgrades.	O	Subject to individual project funding	Council IS Directorate	Fauna connectivity options investigated during road upgrade design works.
	4.28	Audit and renew roadside threatened vegetation markers.	M	$20,000	Council IS Directorate	Roadside markers reviewed and renewed every 5 years.
4.8 Encourage and provide direct and in principle support to Landcare, Primary Industry groups and individual landholders to implement best practice natural resource management along the waterways of the Brunswick and Wilsons River catchments.	4.29	Continue to develop and implement 'Bringing back the Bruns' branded projects to address improvements in riparian and instream habitat, water quality, fish passage and habitat connectivity on Council and private land along the Brunswick River and its tributaries.	M	In house	Council SEE Directorate	5km of riparian habitat along Brunswick River rehabilitated.
	4.30	Seek funding to develop and implement projects addressing improvements in riparian and instream habitat, water quality, fish passage and habitat connectivity on Council and private land along waterways of the Wilson River catchment.	M	In house	Council SEE Directorate	Funding secured for rehabilitation of 5km of riparian habitat along Wilson's River.

Veiny Lace Flower

Fringed Lily, L. Caddick

Subtropical Rainforest, L. Caddick

Chapter 5 – Strategy Implementation

How will the strategy be achieved?

5.1 Resourcing

5.1.1 General revenue

Council's environmental programmes receive core funding from general revenue, with expenditure directed by the Environmental Levy Implementation Policy. Expenditure on biodiversity programs is equivalent to approximately 2% of general revenue, varying slightly year by year in accordance with Council's annual operational plan (for example where contract funding is allocated for specific projects such as mapping, monitoring or additional bush regeneration).

Biodiversity programs, including implementing this Strategy, plus implementing Council's Pest Animal Management Plan, Flying Fox Camp Management Plan and Coastal Koala Plan of Management, are currently implemented by 1 full time permanent and 1.4 temporary staff. These positions, in addition to Council's 3 full time bush regeneration staff, will be required (as a minimum) to deliver the Action Plan. Input from other Council staff will also be required for some specific actions.

In addition, this strategy recommends increasing Council's level of extension services (currently provided by Brunswick Valley Landcare), to improve the capacity of our many private landholders to protect our biodiversity and climate.

5.1.2 Grants

Council currently seeks additional funding for biodiversity projects through grants, for example the NSW Environment Trust, Local Government NSW and NSW Recreational Fishing Trust Habitat Action Grants. This Strategy will increase Council and the community's capacity to secure grant funding through providing a clear strategic framework of aims and objectives, plus an action plan to support funding applications, as well as directing priorities for grant applications. Table 4.1 provides a summary of currently available grants and other funding sources. However, these change over time and resources including the Byron Shire Council Grant Finder and input from Council's Grants Officer will be used to guide available funding options.

Table 5.1 Funding Sources 2020

Fund	Summary	Aimed at	Administered by	Reference
NSW Environment Trust	• Grants fund projects that conserve, protect and rehabilitate the environment, or promote environmental education and sustainability. • Currently the most relevant scheme by which Council may access available funds.	Community, government and industry stakeholders	NSW Department of Planning, Industry and Environment	https://www.environment.nsw.gov.au/funding-and-support/nsw-environmental-trust/grants-available
National Landcare Program	• Projects aimed to address issues such as vegetation loss, soil degradation, pest plants and animals, changes in fire regimes and changes in water quality and flows. • Runs from July 2018-June 2023	Funded through Landcare groups, working in partnership with government, industry, communities and individuals.	Australian Government, Department of Environment and Energy	http://www.nrm.gov.au/national-landcare-program
Conservation Agreements (see Box 12)	• Aimed at encouraging landholders to protect and conserve biodiversity on private land. • Guided by the Biodiversity Conservation Investment Strategy 2018, which sets priority areas for government investment in land conservation.	Private landholders	NSW Government Biodiversity Conservation Trust	https://www.environment.nsw.gov.au/topics/animals-and plants/biodiversity-offsets-scheme/about-the-biodiversity-offsets-scheme/biodiversity-conservation-trust https://www.bct.nsw.gov.au/

Fund	Summary	Aimed at	Administered by	Reference
NSW Climate Change Fund	• Funds programs to address impacts of climate change, including awareness raising and energy and water saving activities.	Landholders and businesses	NSW Department of Planning, Industry and Environment	https://www.environment.nsw.gov.au/topics/climate-change/nsw-climate-change-fund
Local Land Services Grants	• Grants fund natural resource management and sustainable agriculture activities	Community	North Coast Local Land Services	https://northcoast.lls.nsw.gov.au/regions/north-coast/financial-assistance
Brunswick Valley Landcare (BVL)	• BVL supports local Landcare groups and landowners by assisting with grant applications and coordinating multiple landowners to access grants. • BVL is part-funded by Byron Shire Council to implement the Land for Wildlife program in Byron Shire (Box 12).	Local Landcare groups and landowners wishing to improve biodiversity values on their land.	Brunswick Valley Landcare	https://brunswickvalleylandcare.org.au/
Richmond Community Grants Hub	• Website providing updated information about available grants across the North Coast to subscribers	Community groups, local organisations	Local Labour Party member Justine Elliot	https://www.justineelliot.com.au/grants-hub/
Byron Shire Council Grants Finder	• This grants alert and subscription service allows users to search for funding sources and to subscribe for alerts for relevant funding opportunities. • Provides grant writing information and tips.	Available free of charge to the Byron Shire community	Byron Shire Council	https://www.byron.nsw.gov.au/Community/Community-support/Grants-and-funding

Brown Antechinus, D. Milledge

Pig Face, L. Cadick

Brunswick River Reflection, A. Erskine

5.1.3 Community

Many Byron Shire residents have the skills and motivation to protect our local biodiversity. Currently our environmental volunteers contribute over 37,000 hours/year towards conservation in the Shire, which equates to over $1,000,000 worth of conservation work per year* Additionally, around 4,000 ha of private land in the Shire are currently being managed for conservation, including Landcare work sites, Land for Wildlife properties and Wildlife Refuges.

A key element of this Action Plan is for Council to develop ways to support and build the capacity of our environmental volunteers, through partnerships and consultation with key groups (including Friends of the Koala, Byron Bird Buddies, Landcare groups, WIRES, Bangalow Koalas and Zero Emissions Byron), education, and development of a priority restoration map to help community groups to focus on-ground actions to where they can be most beneficial for biodiversity.

5.1.4 Private landholders

NSW Government Voluntary Private Land Conservation Agreements (Box 12) are a significant opportunity for Council to work with private landholders to encourage biodiversity conservation on private land, through awareness raising, training and support. In particular, the Conservation Partners Program offers a range of permanent and non-binding agreements with technical and financial support for landholders undertaking conservation activities on private land. However, opportunities to participate in the Conservation Management Program are restricted because Byron Shire is not mapped as a high priority investment area. Opportunities for Council-managed land to be included in the Biodiversity Offsets Scheme are limited, due to Council's limited land holdings.

5.1.5 Developer contributions

Council's Development Control Plan (DCP) allows some provision for biodiversity enhancement, through tree planting requirements for rural multiple occupancy and tourist developments. A review of these DCP provisions will aim to ensure that opportunities to enhance biodiversity are maximised through Council's development assessment process. This will include looking at more flexible options for biodiversity conservation, e.g. where restoration may have a greater biodiversity benefit than tree planting. Development of a Biodiversity DCP chapter will provide clear guidelines for best practice compensatory planting and habitat restoration.

Pictured below: Land for Wildlife Mother's day planting, A.Ratcliffe

** Estimate based on Volunteering Australia estimated volunteer hourly wage rate of $27.45/hour (https://www.volunteeringaustralia.org/resources/key-facts/).*

Box 12 – NSW Government Voluntary Private Land Conservation Agreements

- **Conservation Agreements are aimed providing an additional income stream for rural landholders to encourage protection and conservation of biodiversity on private land or to compensate for losses of biodiversity elsewhere.**
- **The NSW government has committed $240 million over 2020–21, and $70 million per annum ongoing, to support Voluntary Private Land Conservation Agreements.**
- **Allocation of funding is administered by the NSW Biodiversity Conservation Trust (BCT) and guided by the Biodiversity Conservation Investment Strategy 2018, which includes a map of priority investment areas in NSW for private land conservation.**
- **The range of different types of agreements available are summarised in the table below. The Conservation Partners Program and Land for Wildlife are the most relevant to Byron Shire.**

Program	How it works
Biodiversity Stewardship Agreements • A Biodiversity Stewardship Agreement is a voluntary agreement between the BCT and a landholder to permanently protect and manage an area of land. • Aimed at landholders, companies or councils wishing to generate and sell biodiversity credits under the NSW Government's Biodiversity Offsets Scheme. • Stewardship sites generate biodiversity credits that represent the expected biodiversity improvement resulting from protection and management of the site. • Landholders receive annual **Biodiversity Stewardship Payments** for undertaking conservation management actions on the property and may earn a profit from selling biodiversity credits to a developer, the BCT or other interested parties.	• Landholder checks that they meet eligibility criteria. • At this stage landholders may undertake a feasibility assessment or business case to gather information on the site. • Landholders may also submit an Expression of Interest to identify potential purchasers of credits. • Engage an accredited assessor to conduct a site assessment and produce a Biodiversity Site Assessment Report (BSSAR) and 20 yr management plan. • Site visit from BCT to confirm BSSAR. • BCT arrange Stewardship Agreement. • Landholder sells credits directly to a purchaser or through a broker. When credits are sold, active management of the stewardship site commences. Funds from the sale of credits additional to management costs, are profits.
Conservation Management Program • Aimed at private landholders in Priority Investment Areas *(https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Conservation-management-notes/biodiversity-conservation-investment-strategy-2018-180080.pdf)* or with **conservation assets** such as Threatened Ecological Communities, littoral rainforest, koala habitat or other values identified in the **Biodiversity Conservation Investment Strategy**. • Priority Investment Areas include landscapes that are underrepresented or inadequately reserved in the protected area system. *continued...*	• Tenders announced on BCT website https://www.bct.nsw.gov.au/. • Landholder expresses interest. • BCT staff work with landholder to identify suitable sites and develop a conservation management plan. • Landholder with suitable sites submits a bid for the annual payments required for them to implement the conservation management plan. • BCT assesses bids by biodiversity value and value for money. • Conservation agreement offered if site provides good value for money.

Program	How it works
• Landholders receive annual **conservation management payments** for conservation management actions on the property. • Landholders bid for funding through a tender process. This process is staggered - tenders for specific areas or communities are announced periodically via the Biodiversity Conservation Trust website. • Agreements under the Conservation Management Program can be set in-perpetuity or for a fixed term (minimum of 15 years). • Of limited relevance in Byron Shire as it is not mapped as a **Priority Investment Area.**	• Landholder signs a funded conservation agreement with BCT. • Landholder receives annual conservation management payments, as set out in their bid, for the term of the agreement.
Conservation Partners Program • Aimed at private landholders who are not eligible for the **Conservation Management Program.** • Eligible properties need min. 20 ha to be managed for biodiversity. Smaller properties considered if they contain very high conservation values. • Eligible sites include threatened species habitat & ecological communities, over-cleared vegetation types, important wetlands, old growth forests, rainforest or high conservation value grasslands. • Landholders can apply for **Conservation Partner Grants** - payments of up to $15,000/year for 3 years, for conservation management activities including fencing, pest and weed control, revegetation and habitat restoration. • Landholders also receive practical support from the BCT including site visits, advice, monitoring, education and capacity building. • Landholders may benefit from financial concessions and incentives (e.g. exemptions from land tax) • Agreements are registered on the land title and are binding on subsequent landholders.	• Landholder can apply at any time by completing Landholder Interest form on BCT website https://www.bct.nsw.gov.au/cards/apply-voluntary-agreement • Application assessed by BCT. • Site visit by BCT to assess site and discuss management. • If site is suitable, BCT works with landholder to negotiate the agreement. • Finalised agreement signed by BCT, landholder and mortgagee (if there is a mortgage). • BCT make arrangements for agreement to be recorded on the title of the land.
Wildlife Refuge Agreements • Entry-level option under Conservation Partners Program for private landholders who do not wish to enter into a permanent agreement. • Eligible properties should have a minimum of 10 ha to be managed for biodiversity. *Continued...*	• There is no tender process – landholders can apply at any time. • Landholder completes Landholder Interest form https://www.bct.nsw.gov.au/wildlife-refuge-and-voluntary-conservation-agreements-resources • Applications assessed by BCT.

Program	How it works
• Landholders can apply for **Conservation Partner Grants** for activities including fencing, pest and weed control, revegetation and habitat restoration. • Landholders also receive practical support from the BCT including site visits, advice, monitoring, education and capacity building.	• Site visit by BCT to assess suitable sites and discuss management issues. • For suitable sites, BCT will work with the landholder to negotiate and prepare the agreement.
Land for Wildlife Agreements • Entry-level option for private landholders who do not wish to enter into a permanent agreement, or are not eligible for the Conservation Partners Program or Wildlife Refuge Agreements. • In the Northern Rivers, the BCT is encouraging landholders interested in Wildlife Refuge Agreements to apply for Land for Wildlife Agreements. • Eligible properties should have min. 0.5 ha good quality native vegetation managed for biodiversity. • Landholders can apply for grants of up to $2,000 for conservation management activities. • It is free to join and is not legally binding. • In Byron Shire, members receive support from the **Landcare Support Officer,** including grant preparation, workshops, field days and newsletters.	• Landholders complete the expression of interest form from the Brunswick Valley Landcare website http://brunswickvalleylandcare.org.au/land-for-wildlife/. • Landcare Support Officer conducts site assessment and provides site management advice. • Landcare Support Officer prepares and finalises Land for Wildlife Agreement.

5.2 Monitoring, Review and Reporting

The impacts of Council's actions and those by others on biodiversity need to be monitored to determine if they are meeting the performance indicators and targets set out in the Action Plan (Chapter 4). Monitoring and performance reports are routinely required for grant funding arrangements to demonstrate how public funds have been utilised and to help evaluate the effectiveness of the measures.

The Action Plan details how the Biodiversity Strategy Goals will be implemented. Because this is a ten-year Strategy, and because more detailed planning will be required for implementation of many actions, some of the actions required to achieve a particular goal may change over the lifetime of the Strategy. In other words – while the Goals of the Strategy will remain the same, the action plan may need to evolve in line with new technology, knowledge or resources.

Progress with the Action Plan will be reported annually to Council's Biodiversity Advisory Committee. For each action, the report will summarise:

- Action status – (completed, in progress, planned, any issues identified)
- Action effectiveness – has the action contributed to meeting Strategy objectives?
- Action cost
- Action priority

The Biodiversity Advisory Committee will be responsible for endorsing any changes/updates to the Action Plan.

Council also needs to keep track of the status of biodiversity in Byron Shire, to help gauge the effectiveness of this Strategy and identify where further action is needed. One of the first actions to be implemented as part of this Strategy will be a status update on our biodiversity values, including:

- Review of the status of threatened taxa in the Shire
- Review of the status of invasive plant species in the Shire
- Review of the extent of native vegetation within the Shire.
- Review of the extent of protected native vegetation within the Shire.

This data will serve as a baseline, and review of this data in 5 year's time will help Council and the community to identify where we have made progress and where more work is required. Other monitoring activities that will also inform review of this strategy include:

- Implement a monitoring program for Byron Coast koala population.
- Monitoring effectiveness of ecological restoration at Council sites, including plant species diversity and koala use on koala habitat plantings
- Wildlife surveys at Vallances Road and West Byron Sewerage Treatment Plants
- Regular field surveys conducted by Byron Bird Buddies.

This Biodiversity Conservation Strategy is a ten-year strategy, from 2020-2030. A full review of the Strategy will begin in 2026 to be completed in 2030.

Large Tongue Orchid, L. Caddick

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Appendices

Appendix 1 – Byron Shire Biodiversity Conservation Strategy 2004-2014

Byron Shire Council adopted its first Biodiversity Conservation Strategy in 2004, which has, to date, succeeded in addressing 80% of actions, including 90% of those designated as high to very high priority. These actions were reviewed during development of the revised Strategy – many of them are still current and will continue to be implemented by Council as part of the 2020-2030 Biodiversity Conservation Strategy.

Biodiversity Conservation Strategy Actions Achieved

Total no. of BCS actions by priority level		No. of actions Implemented or commenced	% of actions implemented or commenced
Very high	18	16	89%
High	35	32	91%
Medium	25	17	68%
Low	4	1	25%
Total	**82**	**66**	**80%**

Following the adoption of the 2004 Byron Biodiversity Conservation Strategy, Council received approval from the NSW government to apply a special rate variation of 2% for four years for a Biodiversity Levy to fund implementation the Strategy. Equivalent funds from Council's general rate revenue continue to support Council's biodiversity and coastal programs. **Key 2004 Strategy actions achieved to date include:**

Establishment of the Bush Regeneration Team - This 3-person team, established in 2004, now works on over 40 Council managed sites throughout the Shire. All sites in the current work program contain high conservation value vegetation and 65% provide habitat for threatened species and/or endangered ecological communities.

Development of Byron Shire Bush Regeneration Guidelines - The *Byron Shire Bush Regeneration Guidelines 2010* provide best-practice information and action plans for anyone conducting restoration activities including councils, landowners and community groups.

Dedicated Biodiversity Officer Role - The Biodiversity Officer manages and implements environmental projects for the terrestrial environment in the Byron Shire. This role provides a link between Council and landowners and environmental groups, coordinates partnerships and funding opportunities and facilitates education and information sharing, to help to realise long term biodiversity outcomes.

Byron Coast Comprehensive Koala Plan of Management - The 2012 Koala Habitat Study and 2015 Byron Coast Comprehensive Koala Plan of Management outline a landscape based approach to managing koalas and their habitat in coastal areas, and is used by Council to guide decision making and planning and secure funds for habitat restoration programmes, including the Byron Habitat Corridors project.

Tweed Byron Bush Futures - Byron and Tweed Shire Councils collaborated to restore 985 ha of urban bushland. With funding from the NSW Environmental Trust and partnerships with Brunswick Valley and Tweed Landcare, NRCMA and local land management agencies, the project included restoration of seven Endangered Ecological Communities, installation of interpretive signs and nest boxes and development of a public land volunteers manual. It won a Natural Environment Protection and Enhancement award at the 2010/11 Local Government Excellence in the Environment Awards ceremony.

Local Environment Plan 2014 & Development Control Plan 2014 – These planning instruments aim to protect, restore and conserve native biodiversity and enhance or repair ecological processes and systems, for example through specifying compensatory planting ratios for tree removal, allowing for investigation of unauthorised tree removal and requiring consideration of ecological values in the assessment process including threatened species and ecological communities, wildlife corridors, hollow bearing and koala food trees.

Byron Shire Pest Animal Management Plan 2018-2023 - This plan fosters a collaborative, cross-tenure approach to managing wild dogs, foxes, cats, cane toads and Indian mynas on Council land, and supports Council to assist with pest animal management on private land when funds allow.

Byron Shire Flying Fox Camp Management Plan 2018-2023 - This plan guides the management of five urban flying-fox camps in the Shire. It provides strategies to improve community understanding and appreciation of the critical ecological role of flying-foxes, while also helping to minimise negative impacts.

Appendix 2 – Related Legislation, Strategies and Plans

Australia takes an active role internationally and is party to a number of significant international conventions and treaties that guide and influence the way it protects the natural environment and its biological diversity. While the agreements are non-binding it demonstrates commitment to environmental conservation and ecologically sustainable development.

International Conventions and Treaties

Australia actively participated in international discussions to design the *2030 Agenda for Sustainable Development (2030 Agenda) (United Nations Sustainable Development Summit 2015)* which aims to integrate the social, environmental and economic dimensions of sustainable development. The 2030 Agenda is made up of the 17 Sustainable Development Goals including climate action and management of life below water and on land.

The United Nations Convention on Biological Diversity (UNESCO 1993; ratified by Australia in 1993) covers all ecosystems, species and genetic resources. The main goals are:

- Conservation of biological diversity,
- sustainable use of its components, and
- Fair and equitable sharing of the benefits from the use of genetic resources.

Under the Convention, governments are required to develop national biodiversity strategies and action plans, and to integrate these into broader national plans for environment and development. As a party to the CBD, Australia has agreed to implement the Strategic Plan for Biodiversity 2011–2020, including its *Aichi Biodiversity Targets*. These 20 targets recognise the urgent need for action by everyone to help reduce global biodiversity loss.

The Convention on Wetlands of International Importance as Waterfowl Habitat (UNESCO 1994) – *the Ramsar Convention* – is an intergovernmental treaty for the conservation and use of wetlands and their resources. Contracting Parties are expected to manage Ramsar Sites to retain their essential functions and values for future generations. Resolutions call for management plans for all Ramsar Sites, with appropriate resourcing for implementation, staff training and monitoring. Australia has 66 designated RAMSAR sites but none within Byron Shire.

The *Convention on the Conservation of Migratory Species of Wild Animals (1979)* and three bilateral migratory bird agreements, *Japan - Australia Migratory Bird Agreement (JAMBA)*, *China - Australia Migratory Bird Agreement (CAMBA)* and *Republic of Korea - Australia Migratory Bird Agreement (ROKAMBA)* provides for the protection of migratory birds and their important habitats in the East Asian-Australasian Flyway, protection from take or trade, information exchange and cooperation. 35 species recorded in Byron Shire are listed under these agreements and are a matter of National Environmental Significance under the EPBC Act.

The *Kyoto Protocol (UN 1998)* is the international agreement requiring developed countries to meet national greenhouse gas emissions reduction targets. Australia ratified the Kyoto Protocol in December 2007, with 192 countries in total being signatories. The *Paris Agreement* is the first legally binding global climate deal agreed under the United Nations Framework Convention on Climate Change (2015). It holds 195 signatory countries to a global action plan to keep global warming below 2 degrees Celsius. Australia has a target to reduce emissions by 26-28 per cent below 2005 levels by 2030.

National Strategies and Legislation

Commonwealth planning framework

Australia's Biodiversity Conservation Strategy 2010-2030 (National Biodiversity Strategy Review Task Group 2010) is a guiding framework for government, business and the community, and functions as a policy 'umbrella' over other more specific national frameworks.. The Strategy sets priorities to achieve healthy and resilient biodiversity and provide us with a basis for living sustainably, including:

- Engaging all Australians
- Building ecosystem resilience
- Getting measurable results.

A five year review of the Strategy's operation prompted a revision, to provide better alignment with Australia's international biodiversity commitments. The draft revision: *Australia's Strategy for Nature 2018 – 2030* (Commonwealth of Australia 2017) is currently being considered by the strategy working group, and will be supported by an action inventory identifying what local, state/territory and federal governments are doing to achieve the goals and objectives of the strategy. The inventory will also help non-government stakeholders to identify where their effort can support national areas of focus. Aligning existing information on environmental programs with the action inventory will improve the recording and reporting of activities and achievements that is already undertaken by Council.

Australia's Native Vegetation Framework 2012 (COAG Standing Council on Environment and Water 2012) has been developed by the Australian Government and state and territory governments to build healthier and more connected native vegetation. The framework provides information on how government, the private sector and the community can improve the health and condition of Australia's native vegetation. It translates the principles, priorities and targets of Australia's Biodiversity Conservation Strategy 2010–2030 into specific goals and targets for native vegetation. The National Goals are:

- Goal 1. Increase the national extent and connectivity of native vegetation
- Goal 2. Maintain and improve the condition and function of native vegetation

- Goal 3. Maximise the native vegetation benefits of ecosystem service markets
- Goal 4. Build capacity to understand, value and manage native vegetation
- Goal 5. Advance the engagement and inclusion of Indigenous peoples in management of native vegetation

The impending targets for Goal 1 and 2 are that by 2020 there will be a net national increase in the extent of native vegetation, including where it can contribute to landscape connectivity, and by 2025 there will be a net national improvement in condition of native vegetation. In order to achieve the goals, a key principle of 'no net loss' of native vegetation is applied through a decision-making hierarchy of:

- firstly, consider how the loss can be avoided, if not,
- consider how the loss can be minimised or mitigated, if not
- consider how residual impacts can be offset or compensated for by other actions

A market based mechanism in place in NSW, underpinned by the principle of 'no net loss', is the Biodiversity Offset Scheme which has replaced the Biodiversity Banking and Offsets Scheme (BioBanking). This scheme provides opportunities for landholders, including Councils, to enter voluntary in-perpetuity agreements to conserve and manage native vegetation and threatened species. Details of the scheme are provided under the heading, NSW land management and biodiversity reforms, below.

Australia's Threatened Species Strategy (Commonwealth of Australia 2010) set out an approach for science, action and partnership to assist in reversing species. Partnerships with states and territories are delivering threatened species projects throughout Australia through the Threatened Species Recovery Fund. The National Landcare Programme Phase Two includes an investment of around $1 billion from 2018-2023 to support natural resource management, sustainable agriculture, and biodiversity conservation. This investment will be delivered by the Department of the Environment and Energy and the Department of Agriculture.

Australian Pest Animal Strategy 2017 – 2027 (Commonwealth of Australia 2017) provides national guidance on best practice vertebrate pest animal management. The strategy provides the policy foundations to guide and inform the actions of stakeholders, including landholders, industry, communities and government, rather than prescribing detailed on-ground actions and activities. Byron Shire Council's Pest Animal Management Plan has been developed in accordance with this Strategy to provide a framework for management of pest animals within Byron Shire.

Australian Weed Strategy 2017 – 2027 (Commonwealth of Australia 2017) provides national guidance on best practice weed management and information on where improvements can be made at the national level. It aims to inform plans and actions by state and territory governments, local governments, regional natural resource management agencies, as well as by industry, landholders and the wider community.

Local government responsibilities include:

- adopting and encouraging responsible weed management on their land and in cooperation with other landowners
- assist with coordination of community weed management programs and represent community interests in weed management
- help reduce the spread and impact of high risk weeds, and
- support public awareness about weed issues

The Byron Shire Council Integrated Pest Management Strategy 2019 – 2029 outlines the goals, objectives and priority actions for effective and efficient control of pests on Council owned and managed land. Local Control Authorities (Rous County Council) are responsible for priority weed control programs including enforcement, inspections and training.

Commonwealth Legislation

The Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) is the Australian Government's key legislation for environmental protection and biodiversity conservation. It provides a legal framework to protect nationally and internationally important flora, fauna, ecological communities and heritage places defined in the Act as matters of national environmental significance. Specifically, the EPBC Act aims to:

- conserve Australia's biodiversity
- protect biodiversity internationally by controlling the international movement of wildlife
- provide a streamlined environmental assessment and
- approvals process where matters of national environmental significance are involved
- protect our world and national heritage
- promote ecologically sustainable development.

Four Endangered Ecological Communities, 36 flora species and 63 fauna species in the Byron Shire are currently listed under the EPBC Act. Triggers for referral to the Commonwealth exist for significant impacts to listed communities and species, identified through the Development Applications process and application of LEP and DCP guidelines.

State Planning and Legislation

The NSW planning framework

The State Strategic Plan 2016 – 2026 (NSW Local Land Services) has been developed consistent with the Local Land Services Act 2013 and is designed to deliver products and services that achieve outcomes at the property, community, landscape and industry scales through the improved management of biosecurity, natural resources, agricultural productivity and emergency management. Guided by the State Strategic Plan, each of the 11 Local Land

Services regions has developed a local strategic plan. Byron Shire occurs within the jurisdiction of the North Coast Local Strategic Plan 2016-2021.

NSW Biosecurity Strategy 2013 – 2021 (NSW Department of Primary Industries 2013) sets the overall direction for management of animal and plant pests, diseases and weeds in NSW terrestrial and aquatic environments. It is based on the principle that biosecurity is a shared responsibility. Since the publication of this Strategy, the NSW Government has reviewed all biosecurity related legislation and developed a single new NSW Biosecurity Act, guided by the NSW Biosecurity Strategy and the Invasive Species Plan 2018. Council's Pest Animal Management Plan and Draft Integrated Pest Management Strategy enable Council to meet its obligations under the NSW Biosecurity Act.

The NSW Invasive Species Plan 2018–2021 (NSW Department of Primary Industries 2018) is an update of the NSW Invasive Species Plan 2008–2015. The Plan supports the NSW Biosecurity Strategy 2013–2021 and identifies key deliverables to help prevent new incursions, eliminate or contain existing populations and effectively manage already widespread invasive species. Its scope includes weeds, and vertebrate and invertebrate pests in terrestrial, freshwater and marine environments. Local Land Services (LLS) are responsible for the operational aspects of the plan, including planning and coordination of terrestrial pest animal management in NSW. Rous County Council are the Local Control Authority responsible for priority weed control programs including enforcement, inspections and training.

As part of the NSW Climate Change Policy Framework, the Draft Climate Change Fund Strategic Plan *2017-2022* (OEH 2016) outlines long term objectives to achieve net-zero emissions in NSW by 2050. OEH has developed *Priorities for Biodiversity Adaptation to Climate Change* , with four key priorities:

- Enhancing our understanding of the likely responses of biodiversity to climate change and readjusting management programs where necessary.
- Protecting a diverse range of habitats through building a comprehensive, adequate and representative public reserve system in New South Wales, with a focus on under-represented bio-regions.
- Increasing opportunities for species to move across the landscape by working with partners and the community to protect habitats and create the necessary connections across landscapes.
- Assessing adaptation options for ecosystems most at risk from climate change in New South Wales.

NSW Legislation

The Local Government Act 1993 (LG Act) now incorporates ecologically sustainable development, including biodiversity conservation, as a key aspect of local government operations. Other changes to the Act require the preparation of plans of management (POM) for all land owned by local government and provides for the classification of land into, among other things, natural areas and various subcategories. Council has the discretion to prepare a specific POM for an area or a generic plan that applies to more than one piece of land. However, generic POMs cannot be made for land declared:

- as critical habitat or directly affected by a threat abatement plan or a recovery plan under threatened species laws (sections 36A(2) and 36B(3))
- by council to contain significant natural features (section 36C(2))
- by council to be of cultural significance (section 36D(2)).

Councils should carefully cross reference the requirements of the sections 36A(3) and 36B(4) of the LG Act with the savings and transitional provisions of the Biodiversity Conservation Act 2016 and its regulations.

The Environmental Planning and Assessment Act 1979 (EP&A Act) is the principal legislation for NSW forl environmental planning and assessment of development proposals. The Act provides for the preparation of environmental planning instruments (including SEPP and LEP). This Act guides the management, development and conservation of natural resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages. It also provides for the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities and their habitats, and ecologically sustainable development.

The EP&A Act drives the planning and development processes in Byron Shire, and the Byron Shire Local Environmental Plan (LEP) and Development Control Plan (DCP) have been developed in accordance with the Act. The LEPs stated aims include consistency with the principles of Ecologically Sustainable Development (ESD) and to protect, manage and restore the natural environment. The DCPs specify Council's requirements for quality development and sustainable environmental outcomes on land in the Shire. Creation of Environmental Zones (E-Zones) by Council aims to strengthen the provisions for protection and conservation of the natural environment under the EP&A Act. E-Zones will identify land that of important environmental value and rezone it appropriately to promote conservation and environmentally sensitive management.

The State Environmental Planning Policy - Koala Habitat Protection defines core koala habitat, provides a comprehensive, update list of preferred koala feed trees for different regions of NSW. The SEPP also provides two maps to help protect koalas across NSW:

- The Koala Development Application Map, which shows landholders whether they need to consider the SEPPs development application criteria.
- The Site Investigation Area for Koala Plans of Management Map, which provides local council's with scientifically based guidance on where best to concentrate survey effort when preparing Koala Plans of Management.

The Koala Habitat Protection SEPP comes into effect in

March 2020. Council is reviewing the new SEPP against our existing Coastal Koala Plan of Management and other koala conservation and monitoring activities.

The draft Byron Coast Comprehensive Koala Plan of Management (CKPoM) was developed in 2016 following the completion of the Byron Coast Koala Habitat Study carried out by Biolink in 2012. The CKPoM is a key document informing the BCS. Actions in the BCS that relate to koala protection have been developed to support and align with the CKPoM actions.

From 1st July 2017 the NSW Government replaced the Noxious Weeds Act 1993 with the NSW Biosecurity Act 2015. Under this Act all landowners had a responsibility to control noxious weeds on their property, as part of their General Biosecurity Duty. Council's Pest Animal Management Plan and Draft Integrated Pest Management Strategy enable Council to meet its statutory requirements under the Act whilst fostering a collaborative, cross tenure approach to pest management.

The Coastal Management Act 2016 (CM Act) replaces the Coastal Protection Act 1979 and establishes the new strategic framework for managing the open coast, estuaries and the marine estate in an ecologically sustainable way, for the social, cultural and economic well-being of the people of NSW. The new framework comprises legislation, policies and the development of Coastal Management Programs (CMPs). Coastal councils are required to lead the development of CMPs, in accordance with legislative requirements and a five-staged process.

Council has recently commenced the new legislative process to develop CMPs for the coastline and is presently developing a CMP for open coast areas between Cape Byron and South Golden Beach. Subsequent CMPs will likely focus on the Shire's estuaries and other open coastal area south of Cape Byron to Broken Head. Development of CMPs will be important to manage key threats and ensure values of the coast are retained into the future for the next generation. Key threats to the Byron Shire coastline include (but are not limited to) erosion (short-term loss of sand), shoreline recession (long-term loss of sand), coastal inundation, coastal development encroaching onto coastal hazards, habitat disturbance from increasing use and competing interests, degraded catchment conditions and declining water quality. Consideration of Council's Biodiversity Conservation Strategy and associated actions will be important when developing CMPs to ensure consistency and alignment between the Strategy and CMPs.

The State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP) updates and consolidates into one integrated policy the former SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests), and SEPP 71 (Coastal Protection), including clause 5.5 of the Standard Instrument – Principal Local Environment Plan. The Coastal Management SEPP gives effect to the land use objectives in the Coastal Management Act 2016, by specifying how development proposals are assessed if they fall within the coastal zone.

Approximately 6,400 hectares of land in Byron Shire is within SEPP Coastal Management boundaries, with some overlap between the Coastal Wetland and Coastal Protection Areas and Littoral Rainforests. Where a single parcel of land is identified as different coastal management areas, the management objectives will pertain to the hierarchy of:

a) the coastal wetlands and littoral rainforest area

b) the coastal vulnerability area

c) the coastal environment area, and then

d) the coastal use area.

The Fisheries Management Act 1994 aims to preserve fish stocks, habitats and species and to maintain ecologically sustainable development while ensuring the commercial viability of fisheries in NSW. It provides for listing of threatened species, habitat, communities and processes. The major areas of fish habitat of the Brunswick River, Simpson Creek, Tallow Creek, Belongil Creek, Marshalls Creek and coastal areas to the High Water Mark are under jurisdiction of the Cape Byron Marine Park.

Water Management Act 2000. This Act controls the extraction of water, how water can be used, the construction of works such as dams and weirs, and the carrying out of activities on or near water sources in NSW.

Council has a statutory obligation under the Rural Fires Act 1997 to manage land under its control to reduce the risk of fire escaping its boundaries. Council also has a responsibility to inform landholders of their land management responsibilities under the Act and this is undertaken in cooperation with local NSW Rural Fire Services officers. A Bush Fire Risk Management Plan 2016 (BFRMP) has been prepared for Byron Shire, Tweed Shire and Ballina Shire LGA's with Bushfire Management Zones identified and mapped. A network of Asset Protection Zones (APZs) provide a reduced fuel zone adjacent to assets (people, property and the environment). Removal of vegetation and reduction of fuel loads can impact biodiversity values where APZs are required for new and existing developments, by relevant planning instruments.

NSW Land Management and Biodiversity Reforms

In August 2017 land management and biodiversity reforms in NSW introduced significant changes to how biodiversity is protected, how land development activities are regulated and how the impacts of these activities on the natural environment are managed. A number of pieces of legislation were repealed including the *Threatened Species Conservation Act 1995, Native Vegetation Act 2003, Nature Conservation Trust Act 2001* and parts of the *National Parks and Wildlife Act 1974.*

Key elements of the land management and biodiversity conservation framework are a new Biodiversity Conservation Act 2016 (BC Act) and amendments to the Local Land Services Act 2013 (LLS Act), and associated regulations.

The Biodiversity Conservation Act (2016) (BC Act) together with the Biodiversity Conservation Regulation 2017 outlines

the framework for addressing impacts on biodiversity from development and clearing, including avoiding, minimising and offsetting impacts on biodiversity through the Biodiversity Offsets Scheme. The purported purposes of the BC Act are to:

- conserve biological diversity and promote ecologically sustainable development
- prevent the extinction and promote the recovery of threatened species and ecological communities
- protect habitat for threatened species and ecological communities
- ensure that the impact of any action affecting threatened species and ecological communities is properly assessed.

Assessing the biodiversity impacts of local development

The BC Act requires that Council considers the impact on threatened species and ecological communities before approving developments in NSW. The primary mechanism introduced by the BC Act to address impacts on biodiversity due to development is the Biodiversity Offsets Scheme (BOS). If a development is likely to significantly affect threatened species, the BOS will apply, requiring a proponent to engage an accredited assessor to apply the new Biodiversity Assessment Method (BAM) to assess the impacts of a proposal. *The Biodiversity Conservation Regulation 2017* sets out that a development is likely to significantly affect threatened species if:

- the Biodiversity Offsets Scheme threshold is exceeded,
- it is likely to significantly affect threatened species or communities according to the test of significance in section 7.3 of the BC Act, or
- it will impact on an Area of Outstanding Biodiversity Value.

The Biodiversity Offsets Scheme threshold

The Biodiversity Offsets Scheme (BOS) Threshold is a test used to determine when it is necessary to engage an accredited assessor to apply the Biodiversity Assessment Method (the BAM) to assess the impacts of a proposal. It is used for local developments (development applications submitted to Councils) and clearing that does not require development consent in urban areas and areas zoned for environmental conservation (under the State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017).

The BOS threshold is comprised of two elements: the **area threshold** and the **Biodiversity Values Map threshold**.

The **area threshold** establishes an area of native vegetation clearing above which the BOS threshold is exceeded and a development must enter the BOS.

Any clearing of native vegetation or other action prescribed by Clause 6.1 of the BC Act on land included on the Biodiversity Values Map exceeds the BOS threshold, requiring a development to enter the BOS. The Biodiversity Values Map can be viewed on the Biodiversity Values Map and Threshold (BMAT) Tool to determine whether a development proposal triggers the Biodiversity Offsets Scheme.

The threatened species test of significance

Where the BOS threshold is not exceeded, a 'test of significance' is required to determine whether a development is likely to significantly affect threatened species, threatened ecological communities or their habitats. If the test of significance detects that a significant impact is likely to occur, the development is subject to the same requirements as developments that exceed the BOS threshold, meaning the proponent must engage an accredited assessor to carry out a BAM assessment.

Savings and transitional provisions are also in place to preserve the continued operation of repealed provisions that relate to certain applications for approval under the EP&A Act. These provisions are contained in the Biodiversity Conservation (Savings and Transitional) Regulation 2017.

Importantly, the key elements of the threatened species test of significance only aim to determine whether a proposed development is likely to place a viable local population of a species or the local occurrence of a threatened ecological community at risk of extinction. It is therefore not a useful methodology for identifying anything other than very large-scale impacts or impacts on localised populations of threatened species or ecological communities that are known to be presently at very high risk of local extinction. The test of significance does not take into account the long-term, landscape scale loss and degradation of natural habitats that occurs as natural ecosystems are progressively impacted by development over time ("death by 1000 cuts").

Areas of Outstanding Biodiversity Value

Areas of Outstanding Biodiversity Value are areas that are considered to have irreplaceable biodiversity values that are important to NSW, Australia or globally. Any development within an Area of Outstanding Biodiversity Value will trigger entry into the BOS. There are currently just four declared Areas of Outstanding Biodiversity Value, with no new declarations having occurred since 2006.

The Biodiversity Offsets Scheme and the Biodiversity Assessment Method

Developments and activities that are subject to the BOS are required to avoid and minimise biodiversity impacts. The "residual impacts", are the impacts to biodiversity that remain after all possible measures have been taken to avoid and minimise. The residual impacts of the proposal are then required to be offset through the BOS.

The BAM methodology determines the residual impacts of activities in the form of biodiversity credits which are required to be offset. This can be achieved by obtaining the required biodiversity credits by establishing a Biodiversity Stewardship Site using the BAM or purchasing available equivalent credits on the offset market, paying into the Biodiversity Conservation Fund or paying for a Biodiversity Conservation Action. Once a proponent has obtained the required biodiversity credits, they must "retire" the credits to meet their offset obligation. "Retiring" credits simply means

they cannot be sold again in the offset market. Calculation of biodiversity offsets via the BAM is a relatively new process, and will require Council development assessment staff to work closely with DPIE and expert ecologists to ensure rigorous checks of assessment data and sampling processes. Importantly, biodiversity loss due to development will rarely be replaced through the retirement of biodiversity credits, as the offset rules use a relatively flexible definition of "like-for-like". As an example, the *Biodiversity Conservation Regulation 2017* contains variation rules that allow impacts on a threatened species to be offset with a different threatened species, so long as the offset species has the same or a higher category of threatened species listing as that of the impacted species. Some important habitat elements for threatened species (e.g. tree hollows) are not always identified via the BAM process.

Assessing the biodiversity impacts of Part 5 activities

Councils undertake development activities as part of their everyday responsibilities (e.g. infrastructure upgrades and replacement). The environmental assessment of these activities is undertaken under Part 5 of the *Environmental Planning & Assessment Act 1979*. Unlike local development, proponents of Part 5 activities do not need to consider whether the activity exceeds the BOS threshold. Rather, environmental assessment of Part 5 activities only needs to consider whether the activity is to be carried out in an Area of Outstanding Biodiversity Value or is likely to significantly affect threatened species or ecological communities, or their habitats, according to the threatened species test of significance. If the activity is to be carried out in an Area of Outstanding Biodiversity Value or the test indicates that a significant impact is likely to occur, the proponent can either **opt-in to the BOS** or prepare a **species impact statement (SIS)**.

If a public authority undertaking a Part 5 activity chooses to **opt-in to the BOS**, they must engage an accredited assessor to carry out the BAM, just like proponents of local development. However, unlike for local development, the determining authority may choose to increase or decrease the report's biodiversity credit obligation. If the biodiversity credit obligation is decreased, the determining authority must provide adequate reasoning, although there is no requirement for external assessment of this reasoning. Concurrence from the Environment Agency Head is not required.

If a public authority undertaking a Part 5 activity chooses not to opt-in to the BOS and to instead **prepare a SIS**, they must prepare the SIS in accordance with the requirements of the BC Act and seek concurrence from the Environment Agency Head.

Vegetation clearing on rural land not ancillary to development

Clearing on rural land that is not ancillary to development is now regulated under the Local Land Services Act 2013 (LLS Act). Under the LLS Act, rural land is divided into several categories which are designated on the state-wide Native Vegetation Regulatory Map (NVR Map). The NVR Map is currently in a transitional state without all categories mapped. The categories defined under the LLS Act are:

- Category 1 - "exempt land", and
- Category 2, which is divided into "regulated land", "vulnerable regulated land", and "sensitive regulated land".

On Category 1 - exempt land, native vegetation can be cleared without any form of authorisation.

On Category 2 land, the LLS Act permits clearing of native vegetation for the purposes of "allowable activities" including the construction of rural infrastructure such as fences, tracks, dams and sheds. The LLS Act also sets out a Land Management (Native Vegetation) Code that permits clearing for purposes such as pasture expansion and continuing use. There are some restrictions to the amount of clearing that can be undertaken on Category 2 land, such as maximum clearing distances for individual rural infrastructure activities.

Formal approval from Local Land Services does not need to be sought to carry out clearing on rural land under the LLS Act. There is no legal mechanism to prevent a landowner from clearing on rural land under the LLS Act in preparation for lodging a development application, precluding the ability for Council to assess the biodiversity impacts of the development. Furthermore, and critically, while the NVR Map is in a transitional state without all categories mapped, landholders are responsible for determining the categorisation of their own land. As of the date of writing, the NVR Map has been in a transitional state for 3 years (since August 2017). The state government has not given any indication of when the full Map will be published.

The Biodiversity Conservation Investment Strategy 2018 is a key component of the NSW government's new framework for private land conservation established under the Biodiversity Conservation Act 2016. The strategy guides the Biodiversity Conservation Trust to deliver a $240 million investment in private land conservation over 5 years (with ongoing funding of $70 million each following year). The strategy ranks NSW landscapes into priority investment areas and the higher ranked areas will be the primary focus of government investment in private land conservation. Opportunities for Council to participate in this program are limited as Byron Shire is mapped as a low priority investment area. Funding for conservation on private land may be available from time to time subject to a tender process, as specified 'conservation assets' are targeted by the scheme, including:

- threatened ecological communities listed under commonwealth legislation
- over-cleared vegetation types
- threatened species and their habitats
- important wetlands
- littoral rainforest and coastal wetlands, and
- core koala habitat

Regional Plans and Strategies

The North Coast Regional Plan 2036 guides development of more detailed land use plans, development proposals and infrastructure funding decisions for the 12 local government areas in the North Coast region, including Byron. Responsibility for implementing actions in the Regional Plan is shared with regional stakeholders, including Councils. The current E- Zone assessment process by Byron Council is addressing Priority Action 4, relating to identifying and mapping urban growth areas with potentially high value environmental value and areas of Aboriginal and historic heritage.

The North Coast Regional Strategic Pest Animal Management Plan 2018 – 2023 (North Coast Local Land Services 2018) supports regional implementation of the NSW Biosecurity Act 2015 and NSW Biosecurity Strategy 2013-2021. Byron Shire Pest Animal Management Plan outlines strategies and actions to achieve outcomes that align with the Regional Plan based on principles of shared responsibility, sustainable landscapes and collaborative leadership.

North Coast Regional Strategic Weed Management Plan 2017 – 2022 (North Coast Local Land Services 2017) guides the implementation of the new NSW Biosecurity Act 2015. It relates to all lands and waters (excluding marine) in the North Coast Local Land Services region of NSW. Byron Council is in the North Coast LLS region and meet their obligations regarding weed management under the Byron Integrated Pest Management Strategy.

Adapt NSW has developed the North Coast Climate Change Snapshot 2014, which uses climate change projections from the NSW and ACT Regional Climate Modelling (NARCliM) project. This details projected changes to the region's climate in the near and far future that can be used by the community to plan for the range of likely future changes in climate.

The Northern Rivers Catchment Action Plan 2013–2023 (CAP2) is a statutory, non-regulatory plan developed as the reference plan for natural resource management organisations in the Northern Rivers Region, and to guide the development of annual investment programs. CAP2 was developed under the Catchment Management Authority structure which has since been replaced with Local Land Services regions.

North Coast Local Strategic Plan 2016 – 2021 (Local Land Services) is aligned with the State Strategic Plan in the North Coast Region. It focuses on determining how the priorities for Local Land Services are best achieved at a local level, and is implemented by The North Coast Local Land Services Board.

Far North Coast Regional Conservation Plan 2010. This plan is a partner document to the Far North Coast Regional Strategy, which identifies high conservation value assets and provides general advice on land use planning mechanisms for biodiversity protection across the region. The plan identified where offsets may best be placed to facilitate conservation outcomes.

Local Plans and Strategies

Indigenous Land Use Agreements and other negotiated agreements provide for the protection and management of Aboriginal cultural and heritage areas by the Bundjalung Arakwal people, e.g. Arakwal National Park. Council has a Memorandum of Understanding to ensure that it works in partnership with the Bundjalung of Byron Bay Arakwal People to ensure preservation of cultural practices, traditional sites, significant places and expressions of cultural identity.

Byron Shire Community Strategic Plan 2028 outlines the vision, community objectives and supporting strategies that will guide Council's long-term decision making. Community Objective 3: We protect and enhance our natural environment guides Council's planning and operations in relation to biodiversity conservation. The strategic goals within the Community Strategic Plan are delivered through Council's five-year Delivery Program and annual Operational Plan.

An Integrated Pest Management Policy has been adopted by Council to help guide the development of the draft **Integrated Pest Management Strategy**, to achieve optimal outcomes for the responsible use of pesticides on Council lands. The Strategy meets Council's statutory obligations and uses an integrated pest management approach to consider all available pest control techniques and the responsible use of pesticides on Council lands. The IPMS has been developed in parallel with the BCS, to ensure pest management actions reflect best practice on-ground management for biodiversity conservation.

Byron Shire's Pest Animal Management Plan 2018 - 2023 has been developed in accordance with the Biosecurity Act 2015 and LLA Act. The plan identifies existing and emerging threats and outlines strategies and actions to manage these based on principles of shared responsibility, sustainable landscapes, collaborative leadership and innovation. The PAMP is a key element of the BCS. Actions in the BCS that relate to pest animal management have been developed to support and align with PAMP actions.

Byron Shire Flying-fox Camp Management Plan 2018 – 2023 guides management of five flying-fox camps located in Mullumbimby, Bangalow, Byron Bay and Suffolk Park. While there are 16 known flying-fox camps within Byron Shire, the Plan covers camps that are near houses and Council is working with residents to help protect flying fox habitat and manage the impact of living with flying-foxes at these camps through the implementation of the Plan. The BCS has been developed to support and align with the Camp Management Plan actions.

Byron Local Environment Plans 1988 and 2014 (LEPs) regulate and guide Council's planning decisions regarding land use and development. LEPs allow Council to regulate the ways in which all land can be used and protected through zoning and development controls. The 1988 LEP applies to land with environmental values, listed as a deferred matter. The 2014 LEP applies to other land and aims to make local environmental planning provisions for land in Byron in accordance with the relevant standard environmental planning instrument under section 33A of

the EP&A Act. It is the main tool to guide the expansion of Byron Bay LGA and ensure local development is done appropriately and in an environmentally sensitive manner.

Byron Shire Development Control Plans 2010 and 2014 (DCPs) supplement the statutory provisions of the LEP 2014 by providing more details, guidelines and controls applying to the various forms of development permitted under the provisions of LEP 2014. In accordance with the EP&A Act 1979, the purpose of DCPs is to specify Council's requirements for quality development and sustainable environmental outcomes on land in the Shire. The DCP 2010 applies to land to which the Byron Local Environmental Plan 1988 (LEP 1988) applies i.e. all land deferred from LEP 2014, with the exception of the West Byron urban release area (where DCP 2014 applies). DCP 2014 applies to land to which the Byron LEP 2014 applies. The DCP 2014 includes controls regarding Preservation of Trees and Other Vegetation, but there is currently no specific DCP chapter relating to biodiversity. The DCP 2014 provides planting ratios for compensatory tree planting following tree removal, and also requirements for additional tree planting and/or restoration for development of multiple occupancies and tourist accommodation.

Byron Shire Net Zero Emissions Strategy for Council Operations 2025 was adopted on 20 June 2019 to provide a framework to achieve:

- 100% net zero emissions for Council operations by 2025, and
- Sourcing 100% of Council's energy needs through renewable energy within 10 years (2027).

The implementation of this policy, while having an impact on carbon emissions, is also aimed at encouraging other local governments and departments to work towards the same goals. This will achieve a far greater effect in the pursuit for a more sustainable community and healthy environment.

Byron Shire Roadside Vegetation Management Plan (2012). The aim of the RVMP is to protect threatened species and EECs, balance ecological conservation with the necessities of roadside vegetation management, outline preferred management techniques for roadside vegetation and improve Council's capacity to restore and protect significant roadside vegetation through improved management practices. The RVMP includes a field booklet with maps and maintenance activities for conservation categories and training for relevant maintenance staff and contractors on how to use the booklet.

Appendix 3 – Climate Change

This appendix provides a summary of current climate change projections and impacts, extracted from Council's draft Climate Change Action Plan.

Current Projections

Formed in 1988, the Intergovernmental Panel on Climate Change (IPCC) assesses climate change and its impacts through expert analysis by thousands of scientists from around the world. Every five to seven years, the IPCC issue comprehensive reports utilised by government to make informed decisions regarding climate science, adaptation, vulnerability and mitigation. The current report (AR5) was released in 2013/14 and asserted 'that anthropogenic emissions of greenhouse gases were the highest in history'. These findings led to negotiations that resulted in the Paris Agreement of 2015 where 197 countries committed to limiting global warming to below 2°C. New IPCC reports on climate science, mitigation, adaptation and impacts will be released in stages throughout 2021-22.

Under the Paris Agreement, governments agreed to achieve their Nationally Determined Contributions (NDC's) through emissions reduction targets. In Australia, our NDC is a reduction of 26-28% below 2005 levels by 2030 including land use, land use change and forestry (LULUCF) or 14-17% below 2005 levels excluding LULUCF. However current Climate Action Tracker (CAT, 2019) data shows that meeting the agreed 1.5°C would require reductions of more than 47% (excluding LULUCF) by 2030. Currently, Australia is tracking to exceed our NDC by 8% (excluding LULUCF) (Commonwealth of Australia, 2019).

Based on climate policies that are currently in place across the globe and the gap in what governments have committed to do, the world will exceed 1.5 C warming by 2035 (Wuebbles et al., 2017; IPCC, 2019), 2°C around 2053 and 3.2°C by the end of the century (CAT, 2019).

Since the Australian carbon pricing scheme was repealed in 2014, emissions derived from fossil fuels and industry have increased by 1% per year. Australian carbon emissions are projected to increase by 8% by 2030 (CAT, 2019). Current science states that Australia should be heading towards net zero emissions well before 2050 (The Club of Rome, 2018; CAT, 2019), yet our only emissions target is the Paris Agreement, of a reduction of 26-28% below 2005 levels by 2030 (Climate Council, 2019).

Sea Level Rise

The IPCC Special Report -The Ocean and Cryosphere in a Changing Climate (September, 2019) states that Global mean sea level is rising, with acceleration in recent decades due to increasing rates of ice loss from Greenland and Antarctic ice sheets, as well as continued glacier mass loss and ocean thermal expansion. Increases in tropical cyclone wind and rainfall, and increases in extreme waves, combined with relative sea level rise, exacerbate extreme level events and coastal hazards.

This report is based on projections from CMIP5 climate models using Representative Concentration Pathways (RCPs). RCP's are a set of scenario's that take into account emissions and land use/cover. The table below illustrates projected scenarios from low and high green house gas emissions pathways.

Representative Concentration Pathway 2.6	Representative Concentration Pathway 8.5
Low GHG emissions	High GHG emissions
High mitigation	Lack of policies to combat climate change
1.1 to 2.0 °C by 2030	1.5 to 2.4°C by 2030
66% chance limiting <2°C by 2100	3.2 to 5.4°C warming by 2100

As sea level continues to rise at an increasing rate, extreme sea level events that were considered historically rare (one /100yr) are projected to occur at least annually by 2050 in all scenario's, especially in tropical regions (IPCC, 2019). In addition, sea levels will continue to rise beyond 2100 in all RCP scenarios, exacerbating coastal hazards and projections of increased cyclone intensity and precipitation (IPCC, 2019).

Risks to the ocean and cryosphere include (IPCC SR Oceans and Cryosphere, 2019):

- Marine heatwave increase, resulting in Coral bleaching, loss of biodiversity and ecosystem services, harmful algal blooms, species redistribution
- Ocean acidification, resulting in changes in growth, development, calcification, survival and abundance of species; e.g., from algae to fish
- Ocean deoxygenation and hypoxic events leading to Major changes in ocean productivity, biodiversity and biogeochemical cycles
- Methane and Carbon Dioxide release from permafrost, causing further increased global temperatures through climate feedback

- Strong shrinkage or disappearance of individual glaciers, impacting on water resources, tourism, ecosystems and global sea level.

Biodiversity Impacts

Climate warming has resulted in:

- Increased frequency, intensity and duration of heat-related events in most land regions,
- Shifts in climate zones including the expansion of arid and contraction of polar climate zones resulting in plant and animal range shifts, abundance and change in seasonal activities.
- Accelerated land degradation through increases in rainfall intensity, flooding, drought frequency and severity, heat stress, dry spells, wind, sea-level rise and wave action.
- Coastal erosion intensifying and impinging on more regions adding to land use pressure.

Reporting the most current science on the impacts to human and natural systems as a result of climate change, the IPCC Special Report's from 2018 and 2019 are summarised as follows:

IPCC Special Report on1.5°C Warming (2018)	
Biodiversity impacts of a 1.5°C temperature rise	**Biodiversity impacts of a 2°C temperature rise**
6% of insects, 8% plants, 4% of vertebrates will loose >50% geographic range	18% insects, 16% plants, 8% vertebrates will loose >50% geographic range
Coral reef decline by a further 50-70%	Coral reef decline >99%
Severe & widespread impacts to unique & threatened systems e.g. Biodiversity hotspots	Significant irreversible impacts to unique & threatened systems.
Severe & widespread impacts from extreme weather events such as heatwaves, heavy rain, drought, coastal flooding and heatwaves.	Severe & widespread impacts from extreme weather events such as heatwaves, heavy rain, drought, coastal flooding and heatwaves.
Warming of temperature extremes by 3°C mid latitude.	Warming of temperature extremes by 4°C mid latitude.
6.5% biome (major ecosystem type) transformation/movement	13% biome (major ecosystem type) transformation/movement
Increase in temperature reducing soil carbon storage	Further increasing temperature & further reduced soil carbon storage

The IPCC Special Report on Climate Change and Land (2019) indicates that, in tropical regions, medium and high GHG emission scenarios will result in unprecedented climatic conditions by mid to late 21st century. Permanent changes in one system (atmospheric, marine, or terrestrial) are likely to have a flow on impact on other systems (Steffen et al. 2018), and these flow on effects could cause significant disruptions to ecosystems, society and economies, potentially making large areas of Earth uninhabitable (Ripple et al. 2019).

Potential consequences of delaying action, identified in the IPCC Special Report on Climate Change and Land (2019) include:

- Dryland water scarcity and food supply instabilities
- Exposure of vulnerable people to continued & increasing climate impacts
- Increased requirements for adaptation
- Increased response costs and reduced economic growth
- Reduced future policy space and decreased efficacy of some response options
- Problems of irreversibility of biophysical impacts and tipping points
- Increased need for widespread deployment of land-based mitigation

Responses that reduce risk and support mitigation and adaptation

Measures with immediate impact include:

- conservation of high-carbon ecosystems such as peatlands (which continue to sequester carbon for centuries), wetlands, rangelands, mangroves and forests.

Longer term responses include;

- Afforestation, reforestation and restoration of high-carbon ecosystems, agroforestry and degraded soil reclamation.
- Assisted species relocation.
- Use of local and indigenous knowledge.
- Developing, enabling and promoting access to cleaner energy sources and technologies combating both desertification and forest degradation.
- Diversification of the food system featuring plant-based diets and animal-sourced food produced in resilient, sustainable and low-GHG emission methods.
- Public awareness and adaptation planning.

- Ongoing research into how the climate is changing at a regional level is critical to identify both the challenges and opportunities associated with climate change, and to inform management and policy decisions.

The IPCC Special Report on Climate Change and Land (2019) indicates that agriculture, forestry and other land use account for 23% total net anthropogenic emissions of Greenhouse Gas (GHG). Changes in land conditions (land cover, land use and land state) can affect regional climate and can significantly modify the likelihood, intensity and duration of extreme events. More specifically, changes in forest cover directly affect regional surface temperature through exchanges of water and energy, where increased forest cover enhances evapotranspiration leading to cooling during the growing season. Better land management can contribute to tackling climate change, through restoring degraded land – increasing the soil's ability to store carbon and adopting sustainable land use practices, including sustainable food production, sustainable forest management, reduced deforestation and ecological restoration.

Recent studies indicate that protecting natural forests and restoring degraded natural systems can be a more effective mitigation strategy than planting large numbers of seedlings (Mackey 2014, Moomaw et al. 2019). Existing forest ecosystems (including soils) store more carbon than is found in the atmosphere and the loss of these would trigger significant carbon emissions (Dooley and Mackey 2019). Natural systems are generally more resilient to external shocks and more adaptable to changing conditions than plantations, so provide more stable carbon stocks (Keith et al. 2009). Allowing natural forests to grow to maturity also optimises their biological sequestration potential – natural regeneration of degraded forests has the potential to sequester 40 times more carbon over the course of the century than establishing new plantations (Lewis et al. 2019). Natural forests also provide other benefits such as clean water supply and biodiversity conservation (Dooley 2019). Facilitating natural regeneration adjacent to existing natural forest remnants (which can provide a diverse seed bank), increases the likelihood of creating a diverse and resilient forest for carbon sequestration (Crouzeilles et al. 2017).

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Appendix 4 – Emerging Fire and Biodiversity Issues in Byron Shire

The demise of fire in Byron Shire

Fire has shaped life on earth since plants first emerged onto land around 440 million years ago (Glasspool et al. 2004, Scott (2000). The presence or absence of regular fire across different parts of the landscape creates vibrant patchworks of open and closed ecosystems (Bowman 2000, Bond 2019) that, throughout the Dreaming, were further enhanced by fine-scale Aboriginal mosaic burning (Bowman 1998, Bird et al., 2008). Over half of Byron Shire's plants and animals depend on open ecosystems (Landmark 1999) that are maintained by regular fire. Fire in our eucalypt and paperbark forests, heathlands and grasslands keeps the canopy open, allowing sunlight to sustain rich understoreys of ferns, grasses and shrubs, which in turn provide unique habitat for a wide diversity of animals.

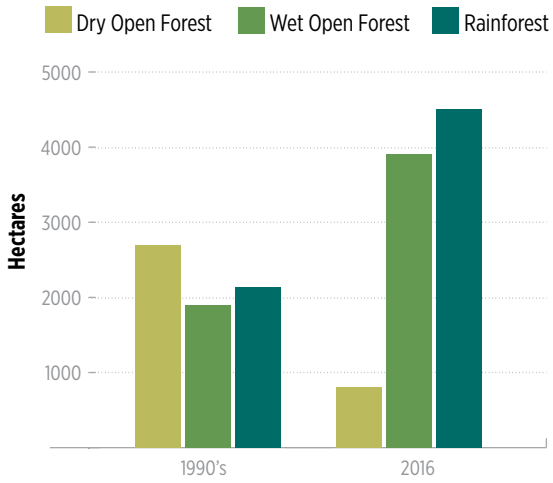
In Byron Shire today however, fires are increasingly rare (NPWS 2013, Baker and Catterall 2015), following the suppression of Aboriginal and unplanned fires and the fragmentation of bushland into small, isolated patches. Without fire, our open habitats are rapidly closing over, shading out understorey plant communities (Lewis et al, 2012, Baker et al. 2020) and displacing key fauna habitats (Tasker et al., 2017; Baker et al. 2019). Accelerated by climate change, tree canopy closure ultimately threatens to displace our open ecosystems entirely. If we wish to maintain our open habitat biodiversity for future generations, regular fire must be urgently restored to these ecosystems.

Open ecosystems close over without fire

In warm, wet regions like ours, open ecosystems need periodic disturbance such as fire to prevent tree canopy closure (Bond 2019). While early ecologists believed that open ecosystems occurred on soils too poor to support closed forest (Beadle 1966), recent global and local research shows that if protected from fire, open ecosystems on even the poorest soils are displaced by closed forest (Ondei et al. 2017, Krishnan et al. 2019). Locally, this is evidenced by extensive areas of coastal rainforest on young, nutrient poor sand dunes.

Over recent decades in Byron Shire, fire-exclusion has seen once-extensive open ecosystems rapidly retreat under a closing canopy. Previously treeless heathlands, sedge lands and grasslands are steadily disappearing beneath invading forest trees, and sun-drenched heathy and grassy Eucalypt forests are being captured by fire-sensitive weeds like Camphor Laurel and Umbrella Tree and invading rainforest pioneers. Comparison of Council's vegetation mapping between 1999 and 2016 (Landmark 1999, Byron Shire Council 2017) shows that canopy closure has reduced the extent of dry open forest and heathlands by 75% and 67% respectively, while both wet open forest and rainforest have doubled over this period (Figure A4.1). These trends indicate that our open ecosystem biodiversity is now the most vulnerable to local extinction.

Figure A4.1 Changes in wet and dry forest cover in Byron Shire from 1990s to 2016



Open ecosystems need fire to survive

Most plants in open ecosystems need regular fire to reproduce: it creates light, open conditions for plants to flower and seed (Gill and Ingwersen, 1976; Turton and Duff, 1992; Ashton and Attiwill, 1994; Dixon et al. 1995; Thomas et al. 2003). However, if fire fails to return before adult plants and their seeds die, these species become locally extinct (Keith, 1996). Such losses can be rapid, with recent local research finding that 50% of understorey plant species can disappear after only 16 years without fire (Baker, et al. 2020). Over longer timeframes, fire-exclusion can also cause dieback of canopy Eucalypts, from increasing soil acidity and root competition from invading fire-sensitive trees (Harvest et al., 2008; Horton et al., 2013).

Not surprisingly, animal habitat within our open ecosystems is profoundly altered by canopy closure, loss of ground layer vegetation and Eucalypt dieback. In Australia, canopy closure and rainforest expansion into open forest can reduce habitat suitability and species diversity of mammals (Lawrence 1997, Jackson et al. 2011), birds (Chapman and Harrington 1997, Russell-Smith and Stanton 2002, Woinarski et al. 2004, Tasker et al., 2017), reptiles (Pringle et al. 2009) and invertebrates (Andersen et al. 2006). Dense ground layer vegetation provides feeding, sheltering and nesting habitat, and the loss of this layer has been linked to declines in Eastern Chestnut & New Holland Mice, Dunnarts and the Eastern Bristle Bird. An invading mid-storey of rainforest pioneers has been found to reduce the diversity and abundance of insectivorous bats (Baker et al. 2019), and the decline of canopy Eucalypts is a major threat to koalas and our hollow-dependent owls, gliders and parrots.

Fire helps prevent weed invasion of open ecosystems

Just like native plants, different weeds have contrasting relationships to fire. While too much fire can benefit exotic grasses in other regions, in Byron Shire lack of fire has allowed many open-ecosystems to become invaded by fire-sensitive weeds such as Camphor Laurel, Umbrella Tree, Privet and Lantana. Carried in as seeds by birds and bats, seedlings and saplings of these weeds quickly form a dense mid-storey that shades out ground layer plants and fauna habitat. Regular fire can reduce invasion of these species by killing seedlings and small saplings. Although larger saplings and trees can re-sprout after fire, regular fire can prevent them from reaching a size where they shade out surrounding plants and set seed.

Heathy open-forest forest, Koonyum Range, A. Baker

Restoring fire and light to our open ecosystems

Exclusion of fire primes our bushland for uncontrollable wildfires in the most severe weather conditions – maximising losses of biodiversity and property. The recent fires of 2019 show that even closed forest (rainforest) can burn under severe fire weather. The question is: do we let it burn on fire's terms, or on our terms? With careful planning, the sensitive and controlled use fire in mild weather conditions can minimise wildfire losses, while also restoring and maintaining open-ecosystems, Aboriginal cultural practices and ancient carbon sequestration pathways.

Cool, slow-moving, patchy burns allow wildlife to seek refuge, minimise canopy damage and reduce smoke nuisance. At the landscape scale, a patchwork of small mosaic burns, implemented over several years, provides a diversity of habitat age classes for plants and animals to complete different life stages, while also reducing wildfire risk by breaking up fuel continuity in bushland. While much can be learned from Aboriginal cultural burning practices, in todays highly degraded and fragmented ecosystems the development and trial of new approaches to fire management will also be necessary. In degraded systems, restoring ecosystem health may likely involve a combination of new approaches to reset ecosystems (e.g. thinning, higher fire intensity) plus traditional approaches, to maintain ecosystems after they've been reset. Situated among the residential areas of Byron Bay, the Byron Clay Heath Restoration Program shows that regular fire can be safely used to restore biodiversity and reduce property wildfire risk, even in a highly fragmented urbanised landscape. Identification of sites requiring fire management to maintain ecosystem health is now a high priority.

Fires in a changing world

Landscape fires are often mistaken as a source of CO_2 emissions, yet recent research shows that landscape fires can in fact facilitate sequestration of vast amounts of carbon as charcoal and ash (Santin et al. 2015; Jones et al., 2019). Fires in open-ecosystems only burn plant material that has grown since the last fire, and as plants regrow before the next fire, all the CO_2 that was released as smoke is again removed from the atmosphere – a carbon neutral loop (Bowman et al., 2009). However, fires also create vast amounts of charcoal and ash that is transferred to long term storage in soils, wetlands or marine deposits. Crucially though, to regrow leaves, twigs and bark that were lost to charcoal, plants must draw all required CO_2 directly from the atmosphere – not the soil – resulting in net CO_2 transfer from atmosphere to long-term sinks with each fire. Worldwide, this transfer pathway is vast and it is estimated that landscape fires generate 250 megatons of pyrogenic char annually (Jones et al, 2019).

What about climate change and canopy closure? Increased CO2 has been found to accelerate canopy closure by accelerating tree growth rates (Bowman et al., 2010; Zhu et al., 2016) in a process called 'CO_2 fertilisation'. Indeed, in northern Australia, rainforest expansion into open-forest can occur even where fire frequencies have increased (Bowman et al. 2010). But don't rainforests store more carbon than Eucalypt forests? Old growth Eucalypt forests are the most carbon-rich ecosystems in Australia, due to the sheer size and density of large old Eucalypts and the persistence of large logs on the ground. Where Eucalypt forests transition to rainforest, the replacement of these giants with smaller less carbon rich trees and the rotting of the large logs can result in CO_2 emissions of ~250 tons per hectare (Moroni et al. 2017).

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Appendix 5 – Stakeholder Engagement Report

Summary of Stakeholder Consultation Events and Activities

Table A5.1 below provides a summary of Council's community engagement activities and events that have been considered during development of this Strategy. Greater detail on community engagement is summarised in the sections below.

In addition to directly engaging our community and stakeholders about the Biodiversity Strategy, Council has also looked at community responses to environmental/biodiversity themes raised during recent community engagement projects for other Council plans and strategies, particularly where there has been a strong community response.

Table A5.1 Summary of stakeholder engagement activities and events considered during development of Council's Biodiversity Strategy

What	When	Who
World Café event at Huonbrook	05/09/2018	Attended by 30 members of the farming community
World Café event at Mullumbimby	05/12/2019	Attended by 40 members of the public including Landcare members, property owners, and local business operators.
Stakeholder meeting with National Parks and Wildlife Service, Arakwal and Marine Parks	07/02/2019	Attended by representatives from Ngulingah Local Aboriginal Land Council (LALC), Bundjalung of Byron Bay Aboriginal Corporation (Arakwal), NSW National Parks and Wildlife Service (NPWS), Cape Byron Marine Parks and Ecosure.
Stakeholder meeting with Jali Local Aboriginal Land Council	07/02/2019	Attended by representatives from Jali LALC and Ecosure.
Stakeholder meeting with Madhima Gulgan Community Association	09/08/2-19	Attended by a Madhima Gulgan representative.
Stakeholder meeting with Bangalow Koalas	22/02/2019	Attended by representatives from Bangalow Koalas.
Update to Byron Shire Council Managers and Directors	05/12/2018	Attended by representatives from Council's management team and Ecosure.
Meetings with Byron Shire Biodiversity Advisory Committee	11/02/2019 11/11/2019 10/02/2020	Council and Community representatives that sit on the Biodiversity Advisory Committee.
Workshop with local ecology experts	15/11/2019	17 local Byron Shire ecologists invited to participate in a workshop on the Biodiversity Strategy. 8 attended and others provided input via email.
Community Survey	2015	426 responses received, representing around 1.4% of the population.
Community website Survey 2018-19	December 2018-April 2019	15 responses received. 89 visits to the website.
Community engagement for: Our Byron Our Future – Community Strategic Plan 2028	November-December 2017	This community consultation program reached 2,769 people through workshops, online engagement, interactive pop up activity, written submissions, business surveys and targeted conversations. While engagement did not specifically address development of a Council Biodiversity Strategy, environmental issues were raised by the community during consultation, and have been considered during development of this strategy.

Community engagement for Council's Sustainable Visitation Strategy	March-May 2019	Over 1,200 people engaged through kitchen table discussions, online forums, workshops and focus groups for both visitors and residents. While engagement did not specifically address development of a Council Biodiversity Strategy, environmental issues were raised by the community during consultation, and have been considered during development of this strategy.

World Café Events

Two world café events were conducted during the Biodiversity Conservation Strategy Review. These were advertised on the Byron Shire Council website, Noticeboard and Facebook page and in local papers: The Echo and The Byron Shire News.

Table A5.2 Summary of World Café Events

Event: World Café, Huonbrook – Date: 5 December 2018

Attended by:
30 members of the farming community, Byron Shire Council staff , EcoSure staff

Key Issues:

Activities carried out by landowners to manage biodiversity

- weed and pest animal control (wild dog, fox)
- chemical free weed control where possible as a precautionary approach
- active restoration including revegetation as individuals or part of a Landcare group
- fencing to exclude cattle, remove cattle or limit stocking, erosion control

Challenges to managing biodiversity

- wild dogs and cats (feral and domestic),
- flood events
- time and cost of restoration especially with chemical free approach
- ad hoc approach across land tenures leading to weed seed source 'over the fence'
- red tape and conflicting information between authorities

How could Council support landowners to enhance biodiversity outcomes?

- rate payer biodiversity pack with access to updated information
- support community education events and workshops
- fund an extension officer as point of contact and carry out site visits
- incentives for responsible land management (rate reduction, subsidise restoration)
- flexible, adaptive approach to weed control on council land
- better transparency on responsibilities of council

Event: World Café, Mullumbimby – Date: 5 December 2018

Attended by:
40 members of the public including Landcare members, property owners, and local business operators, Byron Shire Council staff, EcoSure staff

Key Issues:

- continued habitat loss in an already fragmented landscape resulting in a lack of connectivity on a regional scale
- development pressures from an increasing population and the need for a balance between tourism and conservation
- introduced plants and animals including pets and farmed animals
- ability of council to implement and enforce environmental policies with limited resources

The role of council was seen as providing leadership and support to the community to protect biodiversity but lack of resources was expressed as a major concern. Opportunities for Council to promote and protect biodiversity include:

- environmental levy to fund conservation projects, support bush regeneration team and employ extension field officer
- educational resources, workshops and events
- update corridor mapping and limit development to protect and improve corridor habitat
- public access to regional mapping data and assist coordination of projects in the shire
- policies to identify and assist landowners/groups in gaining access to funding opportunities
- increased resources to monitor compliance of planning rules

Key Stakeholder Meetings

Meetings held with local Aboriginal groups, land management agencies, Council staff and local expert ecologists are summarised in Table A5.3 below.

Table A5.3 Summary of key stakeholder meetings

Representatives from NSW National Parks and Wildlife Service, Bundjalung of Byron Bay Aboriginal Corporation (Arakwal), Ngulingal LALC and Cape Byron Marine Parks
Dates: 15 August 2018

Key Issues:

- Integrate aboriginal language, where available, and introductory statement from elders into Biodiversity Strategy document.
- There are very few plans of management in relation to indigenous cultural heritage. A 2015 Draft plan of management for the Ti Tree Lake Aboriginal Area at Suffolk Park guides management and contains relevant information regarding cultural biodiversity values.
- Arakwal are interested in working in partnership with Council to progress cultural heritage mapping. Culturally sensitive data needs to be managed and controlled in the public domain.
- Marine Park jurisdiction is the high tide mark and borders the BCS plan area at the intertidal zone, Marshall Ck and Simpson Ck. See Marine Parks zoning plan.
- Issues impacting the marine zone are primarily clearing and pollution from run-off and point source events and managed under current legislation
- Coordinated landscape corridors across land tenures, including indigenous land, is a challenge to plan and manage. A strategy of mapping HCV land, koala mapping, corridors and other habitats will help to identify funding requirements and opportunities.
- Climate change and sea level rise predictions need to be considered for planning, however generalised outcomes from modelling means it is a shifting target

Jali Local Aboriginal Land Council
Dates: 7 February 2019

Key Issues

- The need for coordinated engagement with local aboriginal people. A trigger in the decision making pathway that requires dialogue with the relevant LALC and aboriginal communities should be an integral part of the management of natural areas.
- Collaboration – Tweed/Byron, Ngulingah and Jali groups all involved in this region and have significant knowledge that can improve management outcomes for all stakeholders.
- Aboriginal ecology – Flora / fauna species connection, habitat is essential for all species. 'Increase sites' (breeding sites) require protection but are often not considered adequately in management.
- Water – Restrict and manage water mining (bores), pollution is not managed appropriately, cattle need to be restricted from waterways and springs.
- Fire – Important tool of land management and hunting, fire suppression is in conflict with traditional practices.
- Human element – There is a lack of infrastructure for on-site land management, humans are a part of the biodiversity and controlled access should be provided for active land management in designated cultural areas. An Aboriginal Place can be visited by anyone, an Aboriginal Area can only be visited by aboriginal people.

Bangalow Koalas – Date: 22 February 2019

Key Issues

- Main threats to koalas include loss of habitat and mature feed trees, removal of windbreaks that function as corridors, vehicle strikes and dog attacks.
- Challenges include uncertainty around long term viability of offset plantings, impacts of increased population and tourism, lack of regulation protecting mature koala feed trees and unknown impact of climate change.
- Actions identified as critical for the koala population include:
  - Development Control Plans to define best practise for plantings.
  - Strategic koala feed tree plantings.
  - Traffic control measures to minimise vehicle strike in high activity areas.
  - Funding for a baseline koala population survey.
  - Fine scale koala habitat mapping amalgamating data from local groups.
  - Standardise monitoring across funding bodies for long term data analysis.

Madhima Gulgan – Date: 9 August 2019

Key Issues

- Urban growth and development.
- Fragmentation of the connection between land and sea

- A lack of understanding of what should be there – resulting in planting wrong species or inappropriate offsetting of what has been lost.
- Fire management – Current burn practices often different to cultural practices, because they are focussed on hazard reduction or protection of particular species. Traditionally indigenous burns were slow and cool.
- Need for cultural heritage mapping to give the community and Council greater understanding of the cultural landscape. From and indigenous perspective, biodiversity cannot be separated from the cultural landscape – the two go hand in hand. Without biodiversity you don't have a cultural landscape.

Ngulingah Local Aboriginal Land Council - Date: : 27 August 2019

Key Issues

- Need to pass on traditional knowledge regarding biodiversity and useful plants and animals, so that this knowledge can be integrated into land management.
- Introduction of new pest/horticultural plants that replace native plants. Need to promote use of native plants in horticulture, landscaping.
- Need for more education and awareness around cultural burning. Ngulingah work closely with RFS and Firesticks on burns, but do encounter conflicts with neighbouring land managers.
- Conflicts with people wanting to use Ngulingah land for stocking cattle, which is in direct conflict with the biodiversity they are trying to enhance and protect.
- Freshwater ecosystems also high priority – waterways, even small ones, 'fed our people'. Many of these degraded by weeds and their conservation is a high priority for both ecological and cultural value.

Local Ecologists Date: 15 November 2019

Key Issues

- Need to prioritise actions based on scientific evidence.
- Land use change is a key threat. Strategy needs to address ways to protect biodiversity under weakened environmental legislation, e.g. through Council planning scheme.
- Loss of institutional knowledge – need opportunities for staff upskilling, community engagement and knowledge transfer.
- Identify and capitalise on opportunities to improve biodiversity, e.g. through better engagement with 'tree changers' and new landholders; planning scheme mechanisms to encourage restoration and/or appropriate tree planting. No net loss planning policy needs to be resourced and audited to ensure it is implemented.
- Biodiversity in the Shire likely to have declined overall since 2004, but with gains in some areas. Where there have been gains (e.g. Landcare plantings), much of this is not protected.
- Acknowledge local Aboriginal knowledge and identify how the Strategy sits within indigenous land use principles.
- Climate change impacts – need to be addressed through planning scheme and also providing people with clear, simple information on what they can do to minimise climate footprint.
- 2004 Strategy provided for funding for positions including extension and education, which no longer exist. Good community outreach is critical.
- Strategy needs regular review – e.g. every 5 years.
- Maps and species lists are useful for the community and should be available digitally.
- Key information gaps identified:
  - Updated wildlife corridor mapping.
  - Validate HEV mapping against current aerial photography.
  - Identify priority areas for restoration investment.
  - Koala habitat mapping, particularly in hinterland.
  - Resource regular mapping updates, e.g. when State/Federal mapping changes.
  - Knowledge/mapping of threatened fauna habitat is patchy, requires site-specific expert ecological input, and better capture of all fauna records in one database.
  - Updated fire interval status for different ecosystems in the Shire.
  - Georeferenced aerial photography – needs to be updated every few years.
  - Threatened species info from DAs should be in one database.

Council Management Team – Date: 5 December 2018

Key Issues

- Biodiversity Conservation Strategy 2004: 80% of 2004 Strategy actions either implemented or commenced by October 2013. Revised strategy should address actions from the 2004 Strategy that are not complete but still relevant.
- Key issues to address: New legislation, Climate change, Fire management.
- Biodiversity Offsets Scheme still not entirely understood within Council. Opportunities for Byron Council are recognised as limited owing to the small area of land owned by Council. Future planning required to minimise potential future conflict for land 'locked-up' under conservation that may be viable for other uses.

- 2008 Environmental levy was the funding stream for the 2004 BCS actions and Councils Sustainability and Coastal Programs. Biodiversity programs now funded to the value of the levy (plus CPI), from general revenue. Reintroduction of a dedicated Environmental Levy was raised as a possibility in the future but not a likely to be possible at this time due to changes to special rate variation application process.
- Mapping layers are a valuable tool to plan and manage the shires natural assets. Need time and investment to evaluate and bring up to date. Strategy should identify what is needed and why.
- A review of Councils proposed E (environmental) Zones is underway and will provide property scale mapping of high conservation value land and help identify suitable private land for environmental protection.
- The Strategy should show how Council works with landholders, Landcare, other agencies and stakeholders.
- Existing Management Plans should be incorporated, including: Koala Plan of management, Flying Fox camp management plan, Pest Animal Management Plan, Integrated Pest Management Plan.

Community Surveys

Table A5.4 below provides a summary of key biodiversity issues identified during recent Council surveys.

Table A5.4 Issues identified through community surveys

Biodiversity Strategy Community Survey	December 2018-April 2019
Survey Method Opportunities were available for public responses to be lodged via an online survey on the Byron Councils website for people unable to attend the 2018 World Café events. Email feedback was also welcomed via a Council email address. Advertised via Council's Facebook Page.	
Responses 15 Responses received 89 Visits to website	
Summary Responses to survey questions summarised, listed from most to least frequent	

Key values of Byron Shire's natural environment:

- Biodiversity / Diversity of habitats and ecosystems (12)
- Coastal vegetation, clean beaches and marine parks (4)
- Threatened species and communities (3), Beauty of landscape (2), Rainforest vegetation (1), Swimming holes (1), National parks (1).

Most important biodiversity issues in Byron Shire today:

- Protection of threatened species and habitats (9)
- Clearing and habitat fragmentation (7)
- Pest animals and weeds (6)
- Population and development pressures (4), Inappropriate land management leading to habitat degradation (3), Climate change (2), Littering (2), Wildlife vehicle strike (2), Need to plant more trees (2).

Priority biodiversity actions over next decade:

- Conserve threatened species (7)
- Manage weeds and pest animals (5)
- Protect and restore HCV areas and corridors (4)
- Protect water quality and availability (3), Community education (2), Improve resilience to adapt to climate change (2), Control new development (2), Implement appropriate fire regimes in open forest vegetation communities (1), Manage wildlife vehicle strike (1).

Major threats to Biodiversity in Byron Shire:

- Inappropriate development (11)
- Land clearing, habitat fragmentation and loss (7)
- Pest animals and weeds (7)
- Inadequate government management and support (4), Wildlife vehicle strike (3), Impacts of climate change (3), Inadequate investment (2), Impact of domestic pets on wildlife (1), Water quality and quantity (1), Population growth (1).

Ways in which Council can better support landholders in protecting biodiversity:

- Educate people regarding how they can help (7)
- Incentives and support for active responsible land management and habitat restoration (7)
- Revegetate/restore wildlife corridors (4), Assist landowners with feral animal control (3), Planning policies to protect remnant vegetation, including environmental living zones in new developments (3), Penalties for people who do the wrong thing (2), Effective control of weeds on Council land (2), Reducing speed limits on roads (2), Banning plastic bags (1), Removing fences and barriers to native wildlife (1).

Biodiversity Strategy Community Survey – 2015

Survey Method

Online survey

Responses

- 426 responses
- Majority of respondents living rural lifestyle or in an urban situation, followed by farming including hobby and commercial.
- Three age brackets (36-45, 46-55, 56-65) represented the majority of respondents. Almost 15% over 65.

Summary

- Top 3 priority actions for Council:
  - Undertaking bush regeneration work on public land
  - Providing education materials, training and field days
  - Supporting Landcare and Dunecare

  The bottom three activities were:
  - Managing roadside vegetation
  - Managing weeds on public land
  - Protecting the environment through development approvals
- Weed invasion was considered to be the highest threat to biodiversity followed by feral animals, and vegetation clearing and fragmentation. There was also considerable concern about human induced climate change, a lack of knowledge, and chemicals and waste pollution.
- Top 3 conservation priorities for biodiversity:
  - Protecting threatened species and EECs
  - Restoring vegetation along waterways
  - Restoring wildlife corridors.
- The 3 most supported mechanisms for managing and improving biodiversity were nominated as:
  - Environmental zoning in LEP
  - Grant payment for on-ground works
  - Positive recognition for biodiversity management works as part of the development assessment process.

Sustainable Visitation Strategy Community Survey – 2019

Survey Method

Public consultation for development of Council's Sustainable Visitation Strategy involved engagement with over 1,200 people through kitchen table discussions, online forums, workshops and focus groups for both visitors and residents. Questions covered a range of tourism-related themes, including environment and sustainability.

Responses

Visitor focus groups confirmed that visitors are already attracted to the region for its natural 'untouched' environment, and that they support environmentally responsible tourism. Both visitors and the community see it as important to make visitors aware of their responsibilities when visiting places of natural beauty. Nature-based tourism, agritourism, volunteer tourism and eco-tourism were identified through community engagement as key industries on which to focus product development and visitor attraction.

Over 700 responses were received on the question: 'What can Council do to encourage visitors to respect our environment?' Key actions identified are listed below:

What can Council do to encourage visitors to respect our environment?

- Educate tourism providers regarding the benefits of environmental protection, including information packs for providers and incentives to encourage responsible tourism.
- Visitor education prior to travelling
- Provide information regarding wildlife conservation (e.g. ground nesting birds, impacts of dogs on wildlife), using simple, eye-catching and positive messages. Information in the form of fixed signage at key locations, plus brochures and on-line/social media.
- Create better opportunities to engage with visitors verbally through talks, demonstrations and events.
- Use of social marketing to improve effectiveness of engagement.
- Effective branding to market the unique environment and attract visitors that support environmentally responsible tourism.
- Encourage investment in sustainable tourism ventures and ecotourism activities.
- Use of art to promote environmental messages.

Glossary and Acronyms

Adaptive management: Adaptive management is environmental management practice that accommodates uncertainty and responds to events as they unfold. It involves taking a structured, iterative approach to finding the best options for action in the face of uncertainty and risk. It includes monitoring change over time, so that the results of management choices can be assessed and changes made if needed to improve future management. Adaptive management is often characterised as 'learning by doing'.

BAM: Biodiversity Assessment Method

BC Act: Biodiversity Conservation Act 2016

BCT: Biodiversity Conservation Trust

Biodiversity: the variety of life forms, the different plants, animals and micro-organisms, the genes they contain and the ecosystems they form.

Bioregion: a region in which the boundaries are primarily determined by (or reflect) similarities in geology, climate and vegetation.

Bush regeneration: rehabilitation of bushland from a weed infested or otherwise degraded plant community to a healthy community composed of native species.

Other similar plant communities to that occurring on the site, or controlled management of disturbance.

Catchment: the land area drained by a river and its tributaries.

Climate change: Any long-term significant change in the average weather that a given region, or the Earth as a whole, experiences. In recent usage, the term climate change often refers to changes in the contemporary climate due to human activities, primarily the emission of greenhouse gases to the atmosphere (this is sometimes called anthropogenic climate change, or global warming).

Climate change adaptation: human actions designed to minimise the negative effects of anticipated climate change and capitalise on positive opportunities associated with impacts, as well as the changes that will occur in natural systems as climatic conditions change.

Connectivity: measure of the degree of interconnection of habitat for a certain species.

Conservation: one approach to ecosystem management that aims to maintain the continuity of a system, with or without change and refers to the process and actions of looking after a place so as to retain its natural significance.

Critical habitat: means habitat declared to be critical habitat. Otherwise defined in context to conservation biology as the area required by a species for its long-term survival and development (also see minimum habitat requirement).

Degraded land: see land degradation.

DPIE: NSW Department of Planning, Infrastructure and the Environment (previously Office of Environment and Heritage – OEH).

Ecological community: is an assemblage of species occupying a particular area. Their species composition can be determined by factors such as soil type, position in the landscape, climate and water availability. Endangered ecological community is defined under the NSW Biodiversity Conservation Act 2016

Ecological footprint: Our ecological footprint is a measure of our impact on the environment based on consumption of natural resources. There are different ways of calculating a community's footprint, but calculations generally take into account how much energy and natural resources a human community uses, expressed as a measure of how much land and water are needed to produce these resources.

Ecological processes and functions: living and non-living processes that play an essential role in maintaining the integrity and continuity of an ecosystem.

Ecological resilience: In ecology, resilience is the capacity of an ecosystem to respond to a disturbance (or perturbation) by resisting damage and recovering quickly.

Ecological restoration: the process of (or end result of) reinstatement of the structure and dynamics of a pre-existing community. For the purpose of this strategy ecological restoration can include the following:

- The establishment of wildlife corridors through revegetation and vegetation management;
- Weed and introduced animal pest management and control;
- Control and/or management of domestic animals in habitat areas (livestock & pets);
- Bush regeneration and reforestation (assisted regeneration and reconstruction);
- Re-establishing locally native plant and animal species;
- Promoting the development of or re-establishment of ecological processes essential to an ecosystem, a species or a species habitat requirements;
- Amelioration of soil degradation issues (e.g. acid sulphate and saline soils, erosion control, remediation of contaminated sites);
- Improving water quality and flows;
- Controlling pollution and other threats;
- Implementation of ecologically based fire management regimes; and
- Increasing environmental protection via planning controls.

Ecosystem: a dynamic complex of plant, animal, fungal and micro-organism communities and associated non-living environmental attributes that interact as an ecological unit.

Ecosystem diversity: Ecosystem diversity refers to the variety of habitats, biotic communities and ecological processes.

Ecosystem functions: the mechanisms by which ecosystems generate supporting, providing, regulating and cultural services. For example, soil formation is a supporting service generated (in part) through microbial processing of organic and non-organic matter. Biodiversity plays a fundamental role in—and depends on—these complex, interlinked functions.

Ecosystem services: these include things such as water and nutrient cycling, break down of pollutants, water quality, soil formation, creation of oxygen, maintenance of hydrological cycles, pollination of crops etc.

Environment: Includes ecosystems and their constituent parts, including people and communities; natural and physical resources; the qualities and characteristics of locations, places and areas; and their social, economic and cultural aspects.

Environmental weeds: plants that invade native ecosystems and adversely affect the survival of native flora and fauna. Environmental weeds can be foreign plants accidentally or intentionally introduced into Australia, or they can be native plants that have become weedy because they are outside of their normal range.

Endangered species: a species listed under the Biodiversity Conservation Act 2016 or listed as Endangered under the Environment Protection and Biodiversity Conservation Act 1999.

Endemic: having a natural distribution that is confined to a particular geographic region. For example a plant can be either endemic to Australia, an endemic of NSW or even endemic to basalt soils associated with the Mt Warning Caldera.

EPBC Act: Environment Protection and Biodiversity Conservation Act 1999 is the central piece of environmental legislation from the Australian Government.

Extinct: species that have either not been found in recent years despite thorough searching, or have not been collected for at least 50 years.

Fragmentation: the process of progressive loss and isolation of habitat.

Genetic diversity: Genetic diversity refers to the variety of genetic information contained in all individual plants, animals and micro-organisms.

Geographic Information System (GIS): a computer information system that stores, analyses/manages and displays spatial and geographic data.

Habitat: the environment in which a species can occur, survive and reproduce. It is an area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community and includes any biotic or abiotic component.

Habitat loss: removal of vegetation and habitat attributes.

HEV: Areas of High Environmental Value land meeting one of more of the following criteria, as defined by NSW Office of Environment and Heritage:

- Areas protected for conservation – including National Parks, Marine Parks and Crown Flora/Fauna reserves.
- Native vegetation of high conservation value – including over-cleared vegetation types, threatened ecological communities, old growth forests, rainforests and littoral rainforests.
- Threatened species and populations – including key and critical habitat for threatened species, known areas of habitat and endangered species habitat.
- Wetlands, rivers, estuaries and coastal features of high environmental value – including coastal wetlands, riparian vegetation, vulnerable estuaries and intermittently closed and open lakes and lagoons.
- Areas of geological significance.

Home range: the area used by a species for day-to-day activities on a seasonal basis such as feeding, breeding and nesting.

IBRA: Interim Biogeographic Regionalisation for Australia

In-situ conservation: Conserving species within their natural habitat.

Invasive species: A species occurring beyond its accepted normal distribution and which threatens valued environmental, agricultural, marine or social resources by the damage it causes.

Key threatening process: process that threatens, or that may threaten, the survival or evolutionary development of species or ecological communities.

Land degradation: a multi faceted problem encompassing a number of processes, which usually involves the accelerated removal or alteration of soils, or their surface cover, as a result of human activities.

Landscape: All the natural features of land or territory encompassed in a single view (e.g. fields, hills, forests and water), which distinguish one part of the Earth's surface from another.

Local provenance: refers to native species with genetic origin from local catchment (ie the Brunswick Valley or the former Big Scrub or coastal sites). Local provenance will vary between plants and sites depending on individual species lifecycle requirements (e.g. dispersal/pollination range) and site characteristics.

LLS: Local Land Services.

Mesic: a type of habitat with a moderate or well-balanced supply of moisture, e.g. a mesic forest.

Migratory species: those that move from one location to another, then return to the same location on a seasonal or annual basis.

Monitoring: a systematic process involving planned and repeated data collection, analysis, interpretation, reporting and acting on the data.

National parks: all parks and reserves in National Parks and Wildlife Service estate, including national parks, nature reserves, state conservation areas and historic sites.

Native species: normally refers to a species indigenous to NSW but can also be used to describe a species that is locally indigenous to a locality.

Native vegetation: vegetation that is indigenous to NSW, that is, of a species that existed in NSW or a locality within NSW that existed in that location prior to European settlement.

Natural area: a classification assigned to certain community land for the purposes of the Local Government Act 1993. Land should be categorised as a natural area if the land, whether or not in an undisturbed state, possesses a significant geological feature, geomorphological feature, landform, representative system or other natural feature of attribute that would be sufficient to further categorise the land as bushland, wetland, escarpment, watercourse or foreshore.

No net vegetation loss: management practice designed to allow development in an area, but provides for the establishment of an equivalent vegetation assemblage and ecosystem in another similar area to compensate the environment for that loss.

NPWS: National Parks and Wildlife Service (NSW).

OEH: Office of Environment and Heritage (now DPIE)

Offset: measures that are taken, usually as a requirement under planning or conservation law, to compensate for the environmental impacts of a development or other land use action. For example, approval of a new residential development may depend on the developer setting aside an area of land for conservation to offset unavoidable loss of vegetation on the development site.

PCT: Plant Community Type

Population: a group of organisms, all of the same species, occupying a particular area.

Precautionary Principle: A principle of ecologically sustainable development whereby if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

Rare species: species represented by a relatively large population in a very restricted area or by smaller populations spread over a wider range, or some intermediate combination of this distribution pattern. Generally referred to as a species considered to be unusual or present in small numbers, usually but not necessarily due to population decline.

Rehabilitation: general concept referring to the restoration and repair of a degraded ecosystem to its former undisturbed condition. Rehabilitation may take several forms that, depending on the degree of naturalness, ranges from regeneration, restoration, reconstruction, reclamation and stabilisation. Rehabilitation may require implementation of a range of techniques, such as revegetation and weed control. Rehabilitation is a component of ecological restoration.

Refugia: fragments of a once more common habitat that provides refuge for previously widespread species.

Remnant: a fragment of a once more common habitat.

Restoration: the process of (or end result of) reinstatement of the structure and dynamics of a pre-existing community. It is a form of rehabilitation. Also see ecological restoration.

Revegetation: The re-establishment of vegetation in areas that have been cleared or highly modified. The mix of plant species may not be the same as that of the original vegetation.

Riparian: land that adjoins, directly influences, or is influenced by a body of water. This includes land immediately adjacent to small creeks and rivers, riverbanks, intermittent streams or gullies, and areas surrounding lakes and wetlands on river floodplains which interact with the river during floods. The width of riparian land is largely determined by management objectives, and may need to be defined in terms of distances from water bodies or by mapping.

Saltmarsh: is a coastal wetland subject to tidal flooding and vegetated by grasses, herbs and low shrubs that are tolerant of high salinity.

Species: is a group of organisms capable of interbreeding freely with each other but (usually) not with members of other species. It includes any recognised sub-species or other taxon below a sub-species, and any recognisable variant of a sub-species or taxon.

Species diversity: This refers to the variety of species on Earth. Species diversity is usually a measure of the number of species (richness) and their relative abundances for a given point in time.

SEPP: State Environmental Planning Policy.

State Environmental Planning Policy (SEPP): a policy prepared under the *Environmental Planning and Assessment Act 1979* dealing with matters of significance for environmental planning for the whole state.

Threatened (species, populations and ecological communities): is a species, population or ecological community specified in the *Biodiversity Conservation Act* as either endangered, vulnerable, or presumed extinct.

TEC: Threatened Ecological Community listed in Schedule 2 of the Biodiversity and Conservation Act as a critically endangered ecological community, an endangered ecological community or a vulnerable ecological community.

Threatened species: a critically endangered species, an endangered species or a vulnerable species listed in Schedule 1 of the Biodiversity Conservation Act 2016.

Threatening process: a process that threatens, or may have the capability to threaten, the survival or adaptive capacity of a species, populations or ecological communities to persist in a habitat, ecosystem or ecological community. Also see Key threatening process.

Vegetation structure: the pattern of the height, form and density of vegetation.

Weed: A weed is a problem plant. Weeds invade natural ecosystems, reduce agricultural production, or threaten other species (plants and animals). Weeds are often introduced species, but they can also be native species growing outside their natural range.

Wetland: land periodically or permanently inundated with water, comprising emergent aquatic vegetation dominated by characteristic wetland species.

Wildlife corridor: an identified area of habitat or land that is managed to promote the movement, migration, colonisation and interbreeding of plants and animals between two or more larger areas of habitat. Wildlife corridors may consist of vegetated, non-vegetated and lands vegetated with weeds. For the purpose of this Strategy a wildlife corridor includes those areas mapped as a wildlife corridor in the Byron Biodiversity Conservation Strategy but also can include areas not identified in the Strategy.