



# Our Natural Capital

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Wellington's biodiversity strategy and action plan 2015

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**Cover photo:** Juvenile New Zealand fur seal at Frank Kitts Park, Wellington City.

The main Wellington seal colony is at Sinclair Head on the edge of Te Kopahau Reserve. This is a “haul out” area for New Zealand fur seals during winter (May-October). Breeding season is November-January. New Zealand fur seals are also seen around Wellington Harbour.

When around seals, people are advised to stay at least 10 metres away and to keep their dogs on a lead. New Zealand fur seals - particularly those living near the city - connect people with the natural world and represent the link between the marine and terrestrial environments.

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# 1. Summary

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## Our Natural Capital is about Wellington's indigenous biodiversity. These are the species that occur or occurred naturally in Wellington.

Our Natural Capital: Wellington's Biodiversity Strategy and Action Plan is Wellington City Council's vision for the city's indigenous biodiversity. The strategy outlines our vision, goals and objectives, and sets the priorities that give our work direction and purpose, underpinned by a set of guiding principles.

The aim of the strategy is to protect and restore our indigenous biodiversity. In order to protect and restore our indigenous biodiversity we have to connect people with it and carry out research so we can better manage it. These are the four themes under which our biodiversity management guidelines, goals, objectives and actions are grouped.

- To achieve our biodiversity goals, we will aim to protect the ecologically significant areas on both private and public land.
- We will restore these areas, create safe buffer zones around them and connect them together.
- We will reduce pest numbers throughout Wellington City to a point where our native species can survive and expand.
- Throughout the urban environment, we will focus on raising awareness of the issues facing indigenous biodiversity and connecting people to their natural environment. We will enable our community to continue restoration work across all of our reserves and we will support them in these efforts.

We recognise that Wellington is an urban environment and will continue to contain a wide range of species, both exotic and indigenous. As a city, we need to take into account the role of all species in contributing to our cultural identity and our role in protecting species that are threatened in their original habitat. Exotic biodiversity is only considered within this plan where it has a direct role in the survival of indigenous species. The strategy recognises that healthy biodiversity contributes to healthy environments

and that creates healthy people. It also recognises that healthy biodiversity contributes to our economic sustainability - through tourism, by providing a desirable base for businesses, and contributing to our quality of life.

It is the Council's responsibility to recognise, protect, and maintain indigenous biodiversity, but we won't be able to achieve our desired outcomes without working closely with our partners.

Since the 2007 Wellington Biodiversity Action Plan was approved, we have moved from a position of needing to identify much of our significant biodiversity to actively managing it. Our protection and restoration programmes now focus on ecological needs. We continue to question our techniques, and are working to improve our knowledge and refine our approach. The Council's role continues to strengthen, and we are known for being a collaborative organisation. However, we are still facing some major challenges such as the ongoing degradation of our aquatic ecosystems and the development pressures faced through the needs of our growing city.

There are also wider issues that affect the health of Wellington's indigenous biodiversity, including land and water use, waste, response to natural disasters, and transport. While these have an effect on biodiversity and contribute to the success of this strategy, they are dealt with under other plans and policies, as are issues of city-wide resilience.

This strategy ensures that international, national, and regional targets relating to biodiversity are translated into local action, and that Wellington City is positioned as a world leader in urban biodiversity. Our Natural Capital covers biodiversity within Council boundaries and jurisdiction, but acknowledges that biodiversity does not recognise these boundaries.

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We will achieve our goal of protecting biodiversity by focussing on the protection of priority biodiversity sites on public and private land and rare, threatened, or locally significant species; controlling pest animal and pest plant species to sufficient levels and eradicating them if possible; and managing the impact of urban growth and human activity on all ecosystems and remaining habitat.

To restore biodiversity, we will increase the number and population size of indigenous species and their habitats and create resilient ecosystems; we will improve aquatic ecosystem health across the city; put restoration programmes in place for rare, threatened or locally significant species and develop ecological networks across the landscape.

People will be connected with biodiversity by making it a common experience for all Wellingtonians; we will

help people to understand the importance and value of biodiversity to their wellbeing; and enable them to take action to protect and restore biodiversity. A range of partners will work with us to achieve a shared vision for Wellington's biodiversity.

We will gain an increased understanding and knowledge of biodiversity, actively share this knowledge and use it to improve our programmes; we will gain a better understanding of our biodiversity management through enhanced monitoring programmes.

Wellington's residents have made it clear that having an attractive and healthy city environment is important to them, and that they'll work alongside us to achieve this.



**Above:** Tui are a local success story. Due to pest control, their numbers have increased and they are now a common sight in downtown Wellington.



# Part One: Strategy

## 2. Introduction

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This plan supports Wellington’s wider vision to be the “Smart Capital”, and be internationally recognised for its connection with and love of nature. Wellington’s open spaces and natural areas are part of what make Wellington an exciting and vibrant city in which to live, work and visit. Our physical proximity to nature plays a key role in our excellent quality of life, which as a city is our greatest strength. Wellington City Council is also unique in that we manage most of the publically owned open space land (around 4500 hectares).

The purpose of this plan is about ensuring Wellington indigenous biodiversity is protected and restored. Part of ensuring the ongoing protection and restoration of our biodiversity is to get people to value and respect it. We can achieve this through allowing people to form a connection with the natural world. To ensure the best outcome for our biodiversity, we also need to carry out research to create and refine innovative biodiversity management practices.

The protection of biodiversity not native to Wellington is not addressed in this strategy except where exotic species are currently protecting indigenous values such as providing habitat or shelter or can be used as a mechanism to connect people with nature.

Some of the aspects in this plan are aspirational, whereas others are easily achievable. Our community has told us they desire both as part of a comprehensive strategy, provided Council reports back regularly on what has been accomplished. Some actions depend on our partners to implement, and Council will have a facilitation role. Some actions are dependent on future funding decisions, planning decisions, and open to statutory changes.

### 2.2 What is natural capital?

We are a “Natural Capital” due to our natural environment and our nature-driven attractions. It is part of what makes us the “coolest little capital in the world”. It is an important part of what makes people want to live and work here, and helps to attract visitors.

Natural capital is our stock of natural assets, which includes biodiversity as well as earth, air and water. Cities depend on a healthy natural environment that continuously provides a range of benefits, known as ‘ecosystem services’. Healthy ecosystems are the foundation for sustainable cities, influencing and affecting human well-being and most economic activity.

Biodiversity is an integral part of this range of services. The cost to replace, replicate or restore these ecosystem services far outweighs the cost of maintaining and protecting these functions today. The biodiversity that contributes to these services exists in our reserves, parks, urban gardens, waterways, wetlands and coast.

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We can achieve this through allowing people to form a connection with the natural world.

### 2.3 What is biodiversity?

Biological diversity - or biodiversity - is the complete variety of life on earth, and people are an integral part of this. Biodiversity is easiest to understand when you think of the different kinds of plants and animals around us and all the species that support and link them. “High biodiversity” can mean that there are a lot of different species, while “biodiversity loss” means that these species become extinct. Biodiversity is more than plants and animals, however.

Biodiversity also includes:

- genetic diversity, which is the variability in the genetic make-up amongst individuals of the same species
- species diversity, which is the variety of species within a particular area
- ecosystem diversity, which is the variety of ecosystem types and associated biological communities or habitats (eg scrubland, forest, sand dunes, wetlands, streams).

“Biodiversity incorporates all biological life, including fungi and micro-organisms, the genes they contain and the ecosystems of which they form a part. These life forms contribute to essential ecological processes.

#### Global biodiversity

The protection of biodiversity is a global issue and is an essential ingredient of sustainable development. The Convention on Biological Diversity (CBD) recognises that biodiversity is about plants and animals as well as people and our need for food, medicines, fresh air and water, shelter, and a clean and healthy environment. The CBD was reviewed at the 11th Conference of Parties (COP11) in Aichi, Japan in 2011 and a new strategic plan *Living in Harmony with Nature* was developed.

New Zealand is a signatory to the CBD and is bound by the Aichi agreement. *New Zealand Biodiversity Strategy* (2000) was prepared as part of New Zealand’s commitment to biodiversity protection, and established national goals to “turn the tide” on biodiversity decline and included action points for local authorities. Retaining a high level of indigenous biodiversity will result in a high level of global biodiversity. The New Zealand Government is in the process of updating the *New Zealand Biodiversity Strategy* to incorporate the Aichi Targets.

Globally, biodiversity is in decline and the rate of biodiversity loss is accelerating.

#### Indigenous Biodiversity

New Zealand is an internationally recognised ‘hotspot’ for biodiversity. This is because we have exceptionally high numbers of endemic species (species found

nowhere else in the world). This high endemism is largely the result of our long isolation from other land masses and diverse habitat and climate, which has allowed unique flora and fauna to develop. Around

90 percent of New Zealand's insects and marine molluscs are endemic. This is also true for 80 percent of our vascular plants (which includes trees, ferns and flowering plants); 25 percent of bird species; all of our

60 reptiles; our four remaining species of frog and all our species of bat. In comparison, Britain which is a similar size to New Zealand has only two endemic species.

## Biodiversity conservation is about ensuring the:

- viability of naturally occurring local populations of species
- resilience of the range of habitats and ecosystems that makes Wellington unique

### 2.4 Why is this important?

All Wellingtonians (including the Council) have a positive or negative effect on biodiversity, both global and local. This comes through political choices, jobs, economic activities, and daily actions. There is a huge opportunity for all of us to become more aware and more responsible; to enhance biodiversity generally through positive actions, small and large. Perhaps the greatest challenge is to make everyone realise that they have an impact on biodiversity and can play a part in its conservation.

Humans depend on our natural capital (including biodiversity) for a wide range of services, often called ecosystem services, which make life possible. Resilient and stable ecosystems are essential to sustain all of our activities in a functioning environment. The most obvious ecosystem services include the food we eat, the water we drink, the air we breathe, and the plant materials we use for fuel, fibre, building materials and medicines.

There are also many less visible ecosystem services, such as water management, the millions of tonnes of carbon stored by our forests, natural storm defences provided by sand dunes, or the pollination of plants by insects. Without healthy biological resources and ecosystem processes, we would be without basic services such as the production of raw materials, clean water, waste decomposition, soil conservation and climate regulation.

Even less visible are cultural ecosystem services such as the inspiration we take from wildlife and the natural environment, which influences our health and wellbeing. Much of Wellington's distinctive identity, its sense of place, is bound in its natural areas. Ecotourism is important in attracting national and international visitors who visit areas such as Makara Peak Mountain Bike Park, Otari-Wilton's Bush, Zealandia and Taputeranga Marine Reserve. This brings business arising from recreation in our open spaces. There is also intrinsic value in biodiversity and for many, particularly Māori; it is an essential part of their world view.

All life on earth - humans included - depends on a varied and diverse natural environment.

Wellington's natural capital gives us the following services:

- **Freshwater** - Wellington is reliant on drinking water from outside the city boundaries, but this freshwater is reliant on healthy forest catchments and healthy groundwater supplies from artesian wells in the Hutt City area
- **Local climate and air quality regulation** - natural vegetation helps to moderate extremes, and plays a role in improving air quality and reducing pollution
- **Energy** - much our energy comes from solar and wind power



**Above:** Yellow admiral butterflies can be seen throughout urban areas. They pollinate a range of native species, including hebe at Otari-Wilton's Bush. Photo: Galen Eakins.

- **Carbon sequestration and storage** - the City's native bush and exotic forestry is an important part of Wellington's climate change strategy and helps Wellington move towards being carbon neutral
- **Moderation of extreme events due to climate change** - natural ecosystems have an important role in protecting infrastructure and housing from increasingly frequent and severe weather events.
- **Waste-water treatment** - at present streams and the coastal environment are a vital part of our waste-water network. Ecosystems such as wetlands also filter waste and act as a natural buffer to the surrounding environment
- **Pollination services** - healthy ecosystems and a diverse range of pollinators will pollinate many plants, including edibles and ornamentals
- **Recreation and mental and physical health benefits** - recreating in green space is not only a good form of physical exercise but also lets people relax
- **Tourism and economics** - Wellington's natural environment is increasingly one of our selling points for domestic and international tourists, which in turn provides considerable economic benefits.
- **Cultural and spiritual wellbeing and sense of identity** - language, knowledge and the natural environment have been intimately related throughout human history. Biodiversity, ecosystems and natural landscapes have been the source of inspiration for much of our art, culture and increasingly for science. Nature is a common element of all traditional knowledge, and associated customs are important for creating a sense of belonging
- **Soil formation and stabilisation** - soil filters our wastewater, provides essential nutrients to our forests and crops, helps regulate temperature and is the foundation for our cities and towns

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**All life on earth - humans included  
- depends on a varied and diverse  
natural environment.**

**Opposite:** Intensifying southerly swells, as seen by the Karori Rock Light, have led to an increased focus on the resilience of our coast.





### 3. Māori and mana whenua relationship to biodiversity

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Mana whenua of Te Whanganui ā Tara are Taranaki Whānui and Ngāti Toa Rangatira. Mana whenua consider that the relationship with biodiversity is an intrinsic and important part of their responsibilities as Kaitiaki within their whaitua/rohe/takiwā. As mana whenua they encourage collaboration and partnership to ensure that together we care for the environment entrusted to us.

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“Whatungarongaro te tangata,  
toitu te whenua”

“As man disappears from sight,  
the land remains”

Wellington City Council acknowledges the mana whenua status of Taranaki Whānui ki te Upoko o te Ika and Ngāti Toa Rangatira to the Wellington City area and we will work in partnership with iwi groups in the development and delivery of this strategy. We will also support and work with other Māori groups who are active in restoring the mauri of the area. In achieving the vision for Our Natural Capital we will work in partnership with Māori, acknowledging the connection tangata whenua have with our city’s natural taonga and weaving the principles of tikanga Māori, kaitiakitanga and manaakitanga through the work we do.

We acknowledge the unique relationship Māori have with New Zealand’s natural taonga - our indigenous biodiversity - as tangata whenua, and their role as kaitiaki. We also recognise and value the Māori world view in understanding and communicating the unique status of our natural taonga. The holistic approach of the Māori world view speaks of the interconnectedness of species and ecosystems, and the importance of managing at an ecosystem and a landscape scale. It also encompasses the need for the sustainable management of natural resources.

We have strived to ensure the strategy is aligned with Māori approaches to resource management by looking at whole systems, the relationships between these systems, and by recognising the connection of the people with the land.

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“Toitu te marae a Tane, toitu te  
marae a Tangaroa, toitu te iwi”

“Care for the domain of Tane  
Mahuta and Tangaroa, so too  
will the people endure”

I LOVE THIS CITY  
WIND/THAT BLA  
THE LIFE, AND PU  
WARM DECRETI  
HERE THAT ONE  
AND/PRECARIOUS

Patricia Green



## 4. Vision

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### Wellington is Our Natural Capital

We haven't lost any more species indigenous to Wellington and the size of ecologically significant areas has not been reduced. The population size of previously threatened and locally significant species has grown and areas with the potential for future restoration are recognised and valued.

All known original ecosystems are found within Wellington, and a range of indigenous biodiversity thrives within them. These areas provide source populations that can disperse to surrounding areas, enhancing and enabling the ecological restoration of the city's wider habitats.

Wellingtonians are connected to nature. They are knowledgeable and passionate about Wellington's biodiversity and want to live in a city of abundant nature that is in close proximity to them. They have become kaitiaki of the natural environment and take action to support its protection and restoration.

Others come to Wellington City Council for advice on how to manage indigenous biodiversity in an urban context, due to the knowledge we have gained through research programmes. We actively share this knowledge and use it to continually improve our own biodiversity management.



**Above:** Through the work we do with our partners, one day large flocks of kereru will again be a common sight in Wellington's skies. Photo: Tony Stoddard, Kereru Discovery

**Opposite:** This rockpool appears at low tide and is found in the middle of Wellington's waterfront. Opportunities like this make it easy for children to connect with the natural world. Photo: Myfanwy Emery



green

accaro seeger

## 5. Guiding principles

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### **We will build on our natural capital**

This strategy will help to build and enhance Wellington's natural capital. We will respect the importance of indigenous biodiversity to New Zealand and its intrinsic right to exist. The Council's work to protect and restore Wellington's indigenous biodiversity will recognise this. We will protect the high value areas, and restore other areas that allow the city's biodiversity as a whole to thrive.

### **We will work within our city context**

Wellington's natural environment has been heavily modified and consists of a complex mixture of species and habitats across urban, suburban and rural areas. While some introduced species pose a threat to native ecosystems, many do not and are part of Wellington's rich cultural heritage. This strategy acknowledges this and our biodiversity management will work within these novel ecosystems. We will focus on the function provided by species and recognise that ecological function can sit across a range of different land uses.

### **We will weave biodiversity through our city's DNA**

Our indigenous biodiversity is part of our local economy and its conservation is an investment that will yield benefits for present and future generations. Everything we do will seek to bring the importance of nature into mainstream thinking. We will do this by telling the stories of the city's natural and cultural heritage, celebrating and sharing success, and promoting the role of biodiversity in creating a unique identity and sense of place for Wellington, in New Zealand and in the world.

### **We will provide direction and leadership**

As a city, Wellington will provide leadership in highlighting the value of incorporating indigenous biodiversity in urban sustainable development, and will promote the importance of cities that have a connection with and respect for nature. The Council will provide leadership that reflects these values through our policies, strategies and management plans.

### **We will work collaboratively**

The Council is committed to working with iwi, government, agencies, landowners, businesses, researchers and the community. We recognise that we need to share knowledge, costs and benefits, to be clear about our different roles and responsibilities, and to have the capability and resources to contribute.

### **We will recognise the significance of people's connection with nature**

We will recognise the importance of public awareness and education for ensuring the conservation of biodiversity. All Wellingtonians engage with nature at some point in their daily lives and we will acknowledge and build on these experiences. We will promote and enhance people's awareness of and connection to nature. We recognise that these experiences actively contribute to people's sense of health and wellbeing.

### **We will learn from the relationship between Māori and biodiversity**

Matauranga Māori and the wealth of traditional knowledge in the conservation, management and sustainable use of biodiversity will be recognised, promoted and used with the involvement of those who possess this knowledge. We will learn from the principles of manaakitanga, wairua, and kaitiakitanga and include these in everything we do.

### **We will actively engage with research**

The actions in Our Natural Capital will be evidence-based and monitored, informed by research where this exists. We recognise that we do not fully understand the complex interactions between the urban environment, introduced species of plants and animals and native ecosystem functioning. We will not avoid action because of a lack of knowledge, but will instead use this as an opportunity to increase our knowledge. We will be adaptive and aim for continual improvement as new knowledge is gained, and we will actively seek and share this knowledge.

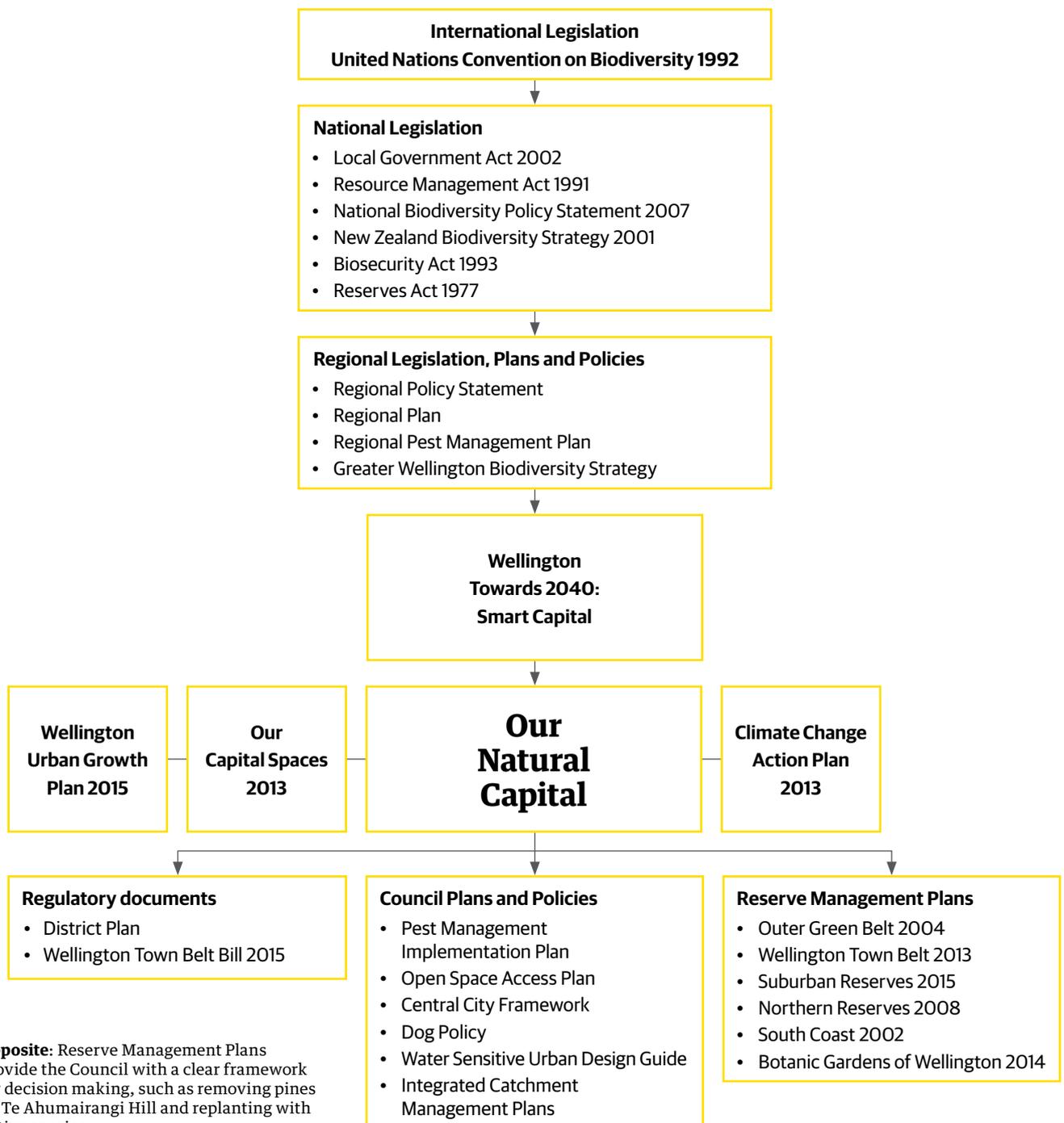


# 6. Policy framework

## Our Natural Capital underpins everything that we do as a City.

The city is part of a greater whole and needs to be seen in the context of the agencies that have responsibilities for the Wellington region and the country as a whole. This includes national and regional policy influencing biodiversity as well as Wellington City Council’s strategy, policy and planning documents. For a more comprehensive description of policy context see Appendix 1.

### Our Natural Capital Policy framework:



**Opposite:** Reserve Management Plans provide the Council with a clear framework for decision making, such as removing pines on Te Ahumairangi Hill and replanting with native species.



## 7. Wellington's biodiversity journey

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### 7.1 Past

Wellington once had flora and fauna as diverse and abundant as any other coastal site in the lower North Island. It was once cloaked in lowland broadleaf-podocarp forest. Trees such as northern rata, with its bright red flowers, would have been a common sight, along with rimu, matai, kahikatea and totara. These would have been emerging through a solid canopy of tawa, kohekohe, kamahi, titoki, pukatea and kowhai. The forest interior would have been thick with climbers like kiekie and supplejack, and the forest floor carpeted with ferns<sup>1,2</sup>. Early European settlers described a number of birds including saddleback, piopio, robin, kokako, stitchbird, banded rail, little spotted kiwi, weka, and huia. Local Māori brought kereru and kaka to the Thorndon village for barter and kakariki were prolific.

The main wetland areas were dominated by flax, rush, raupo and cabbage tree. Flowing into these were major Wellington stream systems, which had abundant eel, koaro, bullies, koura, various galaxiid species and summer swarms of mayflies and other freshwater insects.

Geckos and skinks were easily found in the forests and around the coast and native frogs lived in dark forested streambeds. In summer the forest would have been alive with insects. At night, the morepork (ruru) and laughing owl (whekau) came out to hunt and the calls of brown and little spotted kiwi echoed throughout the forests.

The rocky coastline was the winter haul-out for large groups of male fur seal. Weka cruised the beaches investigating seaweed and driftwood. Large numbers of little blue penguin would have emerged from the surf each night and the coastal ranges covered in sooty and fluttering shearwater burrows. The wind-buffed and salt-laden coastal escarpments facing the Cook Strait (Wellington's south coast), as well as the harbour escarpments, were covered with a mix of coastal forest, dense coastal scrub, flax and tussockland, and scree. The coastal forest was dominated by kohekohe, ngaio, northern rata, akiraho and kowhai, while the dense coastal scrub was characterised by tauhinu, mingimingi, matagouri, prostrate kowhai, pohuehue and speargrass. Tuatara scurried through these coastal forests feeding on large insects, small lizards and sea bird eggs. The coastal waters and harbour would have supported a great number and diversity of fish. The harbour was visited by whales, dolphins and porpoises.

Much biodiversity was destroyed when Wellington was cleared for human settlement and the trend of losing biodiversity as the city grew continued until recent times.

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Trees such as northern rata, with its bright red flowers, would have been a common sight, along with rimu, matai, kahikatea and totara. These would have been emerging through a solid canopy of tawa, kohekohe, kamahi, titoki, pukatea and kowhai.

1 Gabites, Isobel (1993). *Wellington's Living Cloak: A Guide to the Natural Plant Communities*. Wellington Botanical Society/Victoria University Press, Wellington.

2 Boffa Miskell (1998). *Wellington's Native Vegetation: A Brief Survey of Early Historical Records*. Prepared by Boffa Miskell Ltd for Wellington City Council.

**Opposite:** Trees such as this ancient rimu in Otari-Wilton's Bush would have once been a common sight throughout Wellington's lowland forest.

## 7.2 Present

Today we have 5% of our original lowland broadleaf-podocarp forest and 1% of our original coastal forest remaining. We are dealing with these fragmented sites supporting our remaining biodiversity, many of these within the heart of our city. Most of our wetlands have been lost and our streams piped and filled. However, there have been significant achievements in recent times. There has been extensive land protection since the early 1990's. The establishment of Zealandia (NZ's first fully-fenced urban sanctuary) in 1995 and ongoing predator control by the city and regional councils now means a number of iconic (and formerly rare or locally extinct) bird species are now commonly experienced by Wellingtonians. Taputeranga Marine Reserve, established in 2008, is the first marine reserve in the heart of a city. As a result of the 2007 Biodiversity Action Plan we have gained a good picture of where Wellington's ecologically significant sites are within Wellington and these have been mapped. We have 517 identified ecologically significant sites across the city (see Appendix 4), most of which are protected on public land. These sites can be seen in more detail on the Wellington City Council website.

We also have a lot more information on the location of our threatened species. We have moved from a position of needing to identify much of our significant biodiversity to actively managing it. Our restoration programmes have developed from a focus on operational requirements and amenity value to a focus on ecological needs. The Council's role in biodiversity protection and restoration has continued to strengthen, and other organisations respect our achievements.

We have moved from the identification of significant sites, to the identification and protection of the species within those sites and refining our techniques for restoration. We have acknowledged, and continue to acknowledge, the role that people play in Wellington's biodiversity journey.

Our bird monitoring programme has expanded and we have conducted the first study showing the

distribution of native lizards within the city. We have a diverse range of species in Wellington.

Wellington's indigenous biodiversity today is maintained by habitats that can be broadly grouped into ten different categories.

Habitat	Current cover (ha)
Lowland forest	932
Coastal forest	59
Scrub and shrublands	116
Coastal scrub	813
Coastal fringe	1.5
Offshore islands	3.4
Wetlands	3.5
Streams	260km
Urban area	4190
Harbour and coastal waters	8900

Each of these habitats supports a unique community of species and faces a different range of threats; although habitat loss and pest species are common threats across all habitats.

### Forest

#### Lowland forest

Today, the original lowland broadleaf-podocarp forest that remains is mostly found in gullies and remote areas out of the reaches of development, fire and early logging. Some areas have also been preserved by early Wellingtonians. Otari-Wilton's Bush and the Wellington Botanic Garden native forest remnant are some of the best examples of these.

These remaining areas of ancient forest are now accompanied by regenerating forest dominated by the ever-present mahoe. These new forests are growing up through the gorse that colonised Wellington's retired farmland and are now a valued part of Wellington's open space<sup>3</sup>. They also have an important role in buffering the ancient forest from the effects of fragmentation.

<sup>3</sup> Park, Geoff (1999). An Inventory of the Surviving Traces of the Primary Forest of Wellington City. Prepared for Wellington City Council.

The remnants of original forest are important seed sources for the regenerating areas. The regenerating areas are important for the health and eventual restoration of many forest species, including birds such as kaka, kakariki and bellbird, and even the long-tailed bat.

Many animals that would have once occurred in Wellington's forests are now extinct in the region, while others - such as Wellington's green gecko - are thought to be in critical decline. However tui, kereru and kaka have become a regular sight and sound in Wellington and, along with saddleback, kakariki and North Island robin are breeding outside the safety of a fence on the mainland for the first time in over 100 years. Tuatara have also been reintroduced to the sanctuary, as have giant weta, while some lizards have been identified as having translocation potential. Invertebrates such as the giant pill millipede and large land snails may also be released in the sanctuary one day.

### Coastal forest

Some small remnants of original coastal forest can be found along the harbour escarpment, as well as some areas along the south coast. Spooky Gully within Te Kopahou Reserve is a good example of a south coast forest remnant, with its spectacular tree hebe forest interwoven with scramblers such as native jasmine and native clematis.

The coastal escarpment is an important habitat for many species that are now threatened, due mainly to habitat loss. One example is the speargrass weevil. The speargrass weevil and Hutton's speargrass weevil live on speargrass around the south coast. However, speargrass has been decreasing due to grazing, pig rooting and out competition by weeds, so the weevil's habitat is being lost. Another example is the geometrid moth, a striking orange, black and white moth. Again, the main threat to this species is habitat loss, in this case the decline of its host plant pinatoro.



**Above:** There are only a few *Muehlenbeckia astonii* left growing in the wilds of Wellington. It's important that we know where each plant is located. Photo: Anita Benbrook

## Scrub and shrublands

Wellington has two main kinds of scrub and shrubland communities: grey scrub and manuka/kanuka shrubland. These ecosystems are a special part of Wellington's biodiversity, are important transitional communities in ecological succession, and are essential habitat for lizards, insects, and some birds.

### Grey scrub

Grey scrub tends to occur in the relatively exposed environments of Wellington's south-west peninsula. Grey scrub is characterised by small-leaved divaricate shrubs (shrubs that have fine, right-angled branches with a woody, tangled appearance), and climbers such as pohuehue. It is called grey scrub because it appears grey from a distance. In Wellington's grey scrub, you will generally find small leaved coprosmas, pohuehue, coastal tree daisy, tauhinu, kowhai, manuka and bush lawyer. Te Kopahou has one area of dracophyllum, which is locally significant. Grey scrub is also habitat for the nationally vulnerable plant shrubby tororaro and regionally threatened matagouri.

### Manuka/kanuka shrubland

Manuka/kanuka shrubland is generally found on disturbed, previously forested land and lightly grazed hill country. It has become relatively rare in Wellington as gorse has taken over its ecological niche. Wellington's remaining manuka/kanuka shrublands are important to protect to maintain a natural process of forest succession. Research has found that forest growing up through gorse has less diversity of species than forest that grows up through kanuka/manuka, and that some plant groups, such as podocarps, orchids, and small leaved shrubs, are less common in gorse than in manuka/kanuka shrubland<sup>4</sup>.

### Coastal scrub

The scrub of the coastal scarp has fared a little better than the coastal forest but is still in serious decline<sup>5</sup>.

Matagouri is now endangered in the Wellington area, however pohuehue, mingimingi, tauhinu and taupata are still a relatively common sight along the coast, as are flax-clad cliffs.

## Coastline

### Coastal fringe

Wellington's coastal fringe is a dynamic mix of rocky foreshore, coastal turf communities, and coastal dunes.

Wellington's rocky foreshore defines the "wild coast" experience, but on closer inspection the rocky foreshore is actually an intricate mix of coastal turf communities (or herbfields), coastal shrubland, sedges, grasses, and rushes. A great example can be found at Hue-te-Taka (Moa Point).

The unifying feature of Wellington's coastal communities is that they are adapted to tolerate very salty and windy environments. The coastal turf communities are characterised by low-growing dense mats of herbs, often with very fleshy leaves that protect the plant from desiccation (for example NZ iceplant, shore bindweed, glasswort). Sedges, grasses and rushes growing in these areas are also specialists at withstanding salt and dehydration. Many also tolerate very low nutrient levels and shifting sands. You can also find coastal shrubs in some of these areas, including tauhinu, sand pimelea and sand coprosma.

Coastal dunes form where there is shelter from strong waves, a supply of sand, and onshore winds<sup>6</sup>. The side closest to the sea (foredune) is very dynamic, and sand-binding plants have an important role. The two main native sand-binders are pingao and spinifex; however, the introduced marram grass commonly seen. Other native species of coastal foredunes are sand tussock, sand coprosma, and sand daphne. An important site for coastal dunes in Wellington is from Owhiro Bay to Karori Stream. In the past, all five native foredune species have been recorded in this area, but in the last 10 years only sand tussock, spinifex and pingao have been found. This area

4 Sullivan, J.J.; Williams, P.A.; Timmins, S.A. (2007). *Secondary forest succession differs through naturalised gorse and native k anuka near Wellington and Nelson*. New Zealand Journal of Ecology 31.

5 Sawyer, J.W.D (2004). *Plant Conservation Strategy: Wellington Conservancy 2004-2010*. Department of Conservation, Wellington.

6 Milne, R. & Sawyer, J. ( 2002). *Coastal foredune vegetation in Wellington Conservancy*. Department of Conservation, Wellington.

is one of the only sites in the North Island where “Marlborough minimac” geckos occur. Common, brown, and copper skinks and common geckos have also been recorded here<sup>7</sup>.

The interface between the land and the sea is an important access area for many species. The coastal fringe provides habitat for many seabird species, but many of these bird species are now threatened. The banded dotterel is one example; this bird nests in soil, shingle or sand dunes using little, if any, nest material. This means that its breeding ground is easily disturbed by vehicles, people, and pets. Banded dotterel were found breeding on the South Coast in 2014. The little blue penguin is another example. The “little blue” is the smallest penguin in the world, and adults come ashore in Wellington between May and June to prepare nests, laying eggs from August to November. The landscape has been modified, and their habitat destroyed as a consequence. While many of them have adapted to nest under houses or reserves around the coast, many are killed by vehicles, pets, ferrets and stoats.

<sup>7</sup> Melzer S & Bell, T. (2014). Lizard survey of Wellington City Council-administered parks & reserves: final report. Unpublished EcoGecko Consultants Ltd report prepared for the Wellington Council, June 2014.

Wellington’s wild coast also has a number of seal “haul-outs”; the most accessible site is at Red Rocks/ Sinclair Head. Between May and October, male fur seals rest up here between feeding.

#### Offshore islands

The only island that sits within Wellington District is Tapu Te Ranga in Island Bay. Tapu Te Ranga is typical of Wellington’s south coast environment and, as an island, potentially offers a safer place for nesting and roosting seabirds. Tapu Te Ranga is designated as a Conservation Site in the District Plan. It is characterised by flaxland, salt marsh and scrubland, and is home to two rare plants found nowhere else in Wellington: *Crassula moschata* and *Suaeda novae-zelandiae*.

#### Coastal waters

Wellington’s coastal waters are home to marine mammals such as the common dolphin and orca, and Wellington Harbour has unique marine features including a giant kelp forest and a population of rare sponge. The waters of Wellington’s south coast support a rich and varied mix of plants and animals, due partly to a complex topography and wide variety of habitats. The high biodiversity is also due to the collision of three major oceanic currents, the result



**Above:** Taputeranga Marine Reserve is located on Wellington’s south coast, providing easy access to study and interact with marine life, such as these blue moki. Photo: Stephen Journé, Friends of Taputeranga Marine Reserve

being a mix of warm Pacific and cold sub-Antarctic waters. The community of plants and animals found here is unique in New Zealand, with many species occurring at the northern and southern limits of their range. At least 100 different species of algae (seaweed) have been recorded on the south coast, and sea horses, many fish species, crayfish and paua can all still be found. Even Wellington's intertidal zone is filled with a rich number of seaweeds, shellfish and other invertebrates.

Nationwide, scientists estimate that as much as 80 percent of New Zealand's indigenous biodiversity may be found in the sea. Yet less than 1 percent has ever been surveyed. On average, seven new marine species are identified every fortnight.

The marine environment is also very important for many of our freshwater fish species. Almost half of them are diadromous, using both the streams and the sea to complete their life cycle. Our native eels are thought to breed in deep ocean trenches somewhere near Tonga. Their larvae return to New Zealand on the ocean currents and re-enter the stream systems. The adults never return as they die after spawning.

Wellington city is also the access point to Taputeranga Marine Reserve. Taputeranga Marine Reserve is home to over 180 species of fish and is particularly rich in invertebrates such as octopus, rock lobster, crabs and starfish. Only minutes away from downtown Wellington, it gives residents and visitors the opportunity to experience the highly biodiverse marine life of the Cook Strait.

## Freshwater

### Streams

Streams are one of the Wellington region's threatened ecosystems. The streams are also affected by what happens in their catchments, which is the area of land drained by that stream system. Wellington's streams can be described simply as rural streams and urban streams. Rural streams include lower Karori Stream, Makara Stream and Ohariu Stream - as well as some of the more remote streams, such as Oteranga Stream. Much of the country associated with these rural streams has a long history of farming and grazing, and these streams are often characterised by a lack of riparian vegetation. Some rural streams, such as Waiariki and Opau Streams, also flow through areas of fragmented or regenerating forest.



**Above:** Redfin bullies are still found in urban catchments such as in the Kaiwharawhara stream in Trelissick Park, where this male was seen. Photo: Alton Perrie

Urban streams include Owhiro Stream, Kaiwharawhara, Ngauranga and the Porirua Stream system, as well as the “lost streams” (now piped) of Te Aro, Houghton Bay, Miramar and the inner city. The Porirua Stream system, or catchment, is the largest in Wellington, running north from Johnsonville to exit at Porirua Harbour. There are also small local streams throughout Wellington which, although often fragmented, also have important biodiversity values and can provide habitat for landlocked populations of native fish such as banded kokopu. Urban streams have been, and continue to be, heavily modified and influenced by residential development and urban living.

Streams provide habitat and food for hundreds of plants and animals - from algae to eels. They also provide freshwater for people and animals to drink and places for people to play<sup>8</sup>. Although many of Wellington’s streams are small, and some are even dry at certain times of the year (ephemeral), their biological health is important both for the species they support and also for the harbour and sea they flow into.

Stream margins, or riparian areas, are an important part of stream biodiversity - providing riparian habitat as well as improving water quality and habitat by providing shelter for fish, lowering water temperature, removing sediment, filtering out some pollutants, preventing damage to stream banks, and increasing bird and insect life.

Nearly all of New Zealand’s freshwater fish species migrate between freshwater and the sea during their lives and this is an important part of their breeding cycle. This means that if streams are lost, or if there are barriers to fish passage, then fish will become extinct from that particular stream. Giant kokopu, long finned eel and short jawed kokopu are all nationally threatened fish that are known to live in Wellington.

8 Report from the Parliamentary Commissioner for the Environment, Water quality in New Zealand: Understanding the Science, March 2012.

## Wetlands

Wetlands include swamps, bogs, shallow lakes and salt marshes - essentially, any area of land covered by water for some period of time<sup>9</sup>. Man-made ponds are not normally considered to be a wetland. Wetlands are important places for biodiversity - they support more bird species than any other ecosystem. Wetlands are also important places for water purification (trapping sediment and removing excess nutrients), for preventing flood damage, for healthy fisheries, and for recreation<sup>10</sup>.

Most of Wellington’s wetlands have been drained, filled and built on. Those that remain are mostly small swamps, usually characterised by raupo, carex and harakeke. These include a raupo wetland in Opau Valley, a carex wetland in Hawkins Hill and a wetland in Takarau Gorge. There is also a small estuary at the mouth of the Kaiwharawhara Stream and a recreated wetland at the head of the Kaiwharawhara catchment, within Zealandia.

## Salt marsh estuary

Wellington’s only salt marsh estuary is located at Makara Beach. It is the only area in Wellington suitable for inanga spawning<sup>11</sup>. Estuaries are incredibly rich biodiversity spots due to the combination of terrestrial and wetland plants, seashore life and wading birds. At Makara Beach Estuary there is a community of saltmarsh ribbonwood, as well as salt turf, sedges and rushes. It is an important area for white-faced heron, rare freshwater snails, and black flounder breeding.

## Urban, Suburban and Rural Areas

Approximately 4190 hectares of Wellington are in a built urban environment, compared with 4207 hectares of Council-owned open “green” space. The

9 Greater Wellington (2003). Wetland Action Plan.

10 Russi D., ten Brink P., Farmer A., Badura T., Coates D., Förster J., Kumar R. and Davidson N. 2013. “The Economics of Ecosystems and Biodiversity for Water and Wetlands.” IEEP, London and Brussels; Ramsar Secretariat, Gland.

11 Taylor, M.J. & Kelly, G.R. (2001) Inanga spawning habitats in the Wellington Region, and their potential for restoration. NIWA, report prepared for Wellington Regional Council.

urban environment also includes 1200 kilometres of road reserve. About 65% of the total City is rural land.

It is possible for an amazing amount of biodiversity to be found in these environments. There are about as many wild native plants in New Zealand cities (350-550 species or 14- 22 percent of the flora) as in National Parks (440-660 spp. or 17-26 percent) (Given & Meurk 2000)<sup>12</sup>. Some rural land is reverting back to native bush in parts of Makara and South Karori and contains areas of indigenous vegetation and habitat for indigenous fauna.

Much of Wellington's land environment<sup>13</sup> that has been identified as acutely threatened<sup>14</sup> sits within the built urban and rural areas. The majority of this land is privately owned. Planning that protects and restores the indigenous remnants within these areas is critical to the survival of many species, mitigating the effects typical of human occupation<sup>15</sup>.

Private gardens can greatly contribute to the overall biodiversity of the city through suitable plant choice and gardening practices. This not only provides a habitat for the plants themselves, but also creating an attractive environment for indigenous birds, lizards and insects.

People's interaction with the natural environment also plays a key role; it is within the urban area, including Wellington's central business district, that most people experience these interactions. An awareness of the value of biodiversity in our own

backyards can lead to an appreciation of the ecological importance of the wider landscape. In this context, social objectives can be as important as ecological outcomes<sup>16</sup>. People in Wellington are increasingly aware of our indigenous biodiversity, but often this isn't translated into action.

### Introduced species

New Zealand is characterised by a mix of native and introduced species, which make up the country's total biodiversity. New Zealand has the highest number of introduced mammals of any country in the world and the second highest number of introduced birds. We also now have more introduced species of vascular plants in the wild than native ones, and this number is increasing all the time.

Many of the pressures on New Zealand's indigenous biodiversity are from plants and animals that were introduced with the arrival of humans. These species were introduced into Wellington from other parts of the country, as well as from overseas. However, these introduced species are neither all "good" nor all "bad".

Introduced species can threaten our indigenous biodiversity through processes such as out-competition, hybridisation, predation, and browsing. But they can also provide benefits depending on the situation in which they are found.

Introduced species can provide complementary food for a range of indigenous species. For example, the presence of bottlebrush from Australia provides a feeding source for tui. A forest stand, whether indigenous or exotic, provides an extra dimension of habitat (height) in comparison with grassland. This is reflected in the indigenous insect and bird populations that find cover in these habitats.

Our primary production is dependent on introduced biodiversity in agriculture, horticulture and forestry. The revenue from this introduced biodiversity also enables us to further protect our indigenous biodiversity.

12 Given, D.; Meurk, C. D. (2000). Biodiversity of the urban environment: the importance of indigenous species and the role urban environments can play in their preservation. *In*: Stewart, G. H.; Ignatieva, M. E. ed. Urban biodiversity and ecology as a basis for holistic planning and design. Proceedings of a workshop held at Lincoln University 28-29 October 2000. *Lincoln University International Centre for Nature Conservation No. 1*. Christchurch, Wickliffe Press. Pp. 22-33.

13 Leathwick, J; Morgan, F; Wilson, G; Rutledge, D; McLeod, M; Johnston, K. (2003). Land Environments of New Zealand: Technical Guide. Auckland: David Bateman Ltd.

14 Walker, S; Price, R; Rutledge, D. (2005). New Zealand's remaining indigenous cover: recent changes and biodiversity protection needs. Report no: LC0405/038 prepared for Department of Conservation, by Landcare Research.

15 Clarkson, B; Wehi, P; Brabyn, L. (2007). Bringing back nature into cities: Urban land environments, indigenous cover and urban restoration. CBER report No. 52. University of Waikato, Hamilton.

16 Kilvington, M; Allen, W. (2005). Social aspects of biodiversity in the urban environment. *In* Greening the City. Royal New Zealand Institute of Horticulture (Inc.).

Introduced species can be used to effectively convey conservation messages and used as examples for education purposes, such as at Wellington Zoo and the Wellington Botanic Garden. The messages of conservation and sustainability can be shared regardless of the provenance of the species involved. These places also run breeding and propagation programmes, safeguarding global genetic biodiversity in a controlled environment.

Wellingtonians value many introduced species for aesthetic, cultural, and heritage reasons. Introduced species can enable the community to identify with the city by providing evidence of its past in the existing environment. For example, the Wellington Botanic Garden has some of the oldest radiata pine in the country (dating back to the 1860s), which went on to become New Zealand's main timber tree. One area of significance to local iwi is a karaka grove between Red Rocks/Pariwhero and Sinclair Head/Te Rimurapa, which is associated with a pre-European Māori settlement site. Karaka is native to the north of the North Island, but has been introduced to Wellington.

Pohutukawa, another introduction to Wellington from the north of the North Island, is also of cultural significance and contributes to Wellington's sense of place.

The challenge is to find a balance between the benefits provided by introduced species and the threats they may present to local biodiversity. This balance is best determined on a case-by-case basis.

#### **Surrounding districts**

Wellington's biodiversity does not end at the edge of Wellington City's boundaries, neighbouring areas are very important. For example, many birds migrate to and from Kapiti Island in the north-west, the Tararuas to the north, and the Rimutakas to the east. Stream systems, such as that drained by the Porirua Stream, can incorporate multiple districts within their catchment area. Although this action plan focusses on Wellington City's biodiversity, we must be aware that it is not confined to legal boundaries and ensure that we work with our neighbours to ensure local biodiversity protection.



**Above:** The Wellington Botanic Garden is a place where many people begin to experience the natural world. The species within them form an important part of people's journey, whether exotic or native.

### 7.3 Future

In the future, as a result of adaptive management, partnerships, and ongoing investment, Wellington has achieved the biodiversity goals stated in 2015.

Our significant ecosystems are healthy and resilient to change. They are valued and no longer under threat from people's actions. They contain a complex array of habitats and a large diversity of indigenous plants and animals thrive within them.

Urban and backyard conservation is at the centre of everything we do. We support and initiate restoration programmes across people's backyards as well as within reserves. Wellingtonians willingly contribute to the ongoing restoration and protection of their natural environment. They know how important it is for them to spend time in natural areas and they eagerly do so, whether joining a community planting beside Owhiro stream, picnicking in Otari-Wilton's Bush, mountain biking in the Wellington Town Belt or snorkelling in Taputeranga Marine Reserve. There is national recognition of the role of urban parks in helping people to begin their natural journey, and the benefits to people encountering indigenous wildlife within our cities.

Restoration planting within reserves, large native street trees and people planting in their own backyards has created stepping stones between isolated remnants. This allows indigenous wildlife to disperse to surrounding areas, assisting in the ecological restoration of the city's wider habitats. All ecologically significant sites are protected and have large buffer zones, expanding and protecting them; and corridors where possible, linking areas through recently established community planting.

We have moved from focusing on planting for habitat creation to managing species in clever and innovative ways, working closely with our partners. We know exactly where our threatened species are and what they need within an urban context, and we are actively managing them to achieve their lasting protection. The species spilling out from sites such as Zealandia and Otari-Wilton's Bush inspire people to

take action in their own backyards to make our city safe for indigenous wildlife.

Less effort is required to control and eradicate pest species and we continue to refine our methodologies, working closely with the community. We have reduced our dependence on toxins and chemical pest control, instead using innovative trapping methods and biocontrol to deal with environmental pests. Biocontrol agents have eliminated the threats of weed species such as tradescantia and darwins barberry. Miramar Peninsula has been designated as New Zealand's first pest free urban area and the difference to our biodiversity is noticeable. This is another step towards eradicating significant pests from Wellington.

Catchments all have coordinated groups of volunteers working across them. They are well vegetated and all streams have wide riparian strips dense with native vegetation. Streams within reserves have been daylighted, creating further habitat for indigenous freshwater species and areas for nature play. Barriers to fish passage have been removed and artificial wetlands capture and treat stormwater.

We have a clear understanding of how the aquatic system within Wellington works and despite ongoing growth, we manage our stormwater in a way that doesn't create any adverse effects on our freshwater or marine environments. We advocate for the marine environment and our role in this is supported and recognised by our partners.

Wellington is a sought-after destination for international and domestic visitors because of its amazing combination of natural areas and thriving wildlife within a vibrant city. Healthy ecosystems and accessible natural areas are seen as an inseparable part of our economic growth.

When other cities are trying to restore biodiversity in an urban context, they use Wellington as a case study for how it can be done. We share the knowledge we have and use it to continually improve our own biodiversity management.

**Opposite:** The water sensitive urban design of Waitangi Park contributes to improved water quality, amenity and biodiversity values. This is a benchmark for urban design across Wellington.





We need to involve our community in all that we do, and enable them to take action. This includes everything from planting and pest control to protecting our freshwater and marine environments.

## 8. Concept plans

These concept plans are an illustrative example of what the actions could look like when pulled together under a single overarching project. They describe generally, in narrative and with illustrations, the vision of each project and what its goals and objectives are. They provide a set of actions that, if followed, should ensure that the vision is realised.

### 8.1 Wildlife Safe Wellington

Wildlife Safe Wellington is about creating a safe haven for indigenous fauna through the city by maximising pest animal control and getting people planting in their backyards. It's an opportunity for a city to be the place where people connect with our indigenous fauna. This project strengthens current populations of indigenous fauna and allows them to spread.

Wildlife Safe Wellington means that nesting success of indigenous bird species has improved; people are aware of indigenous flora and fauna and are planting indigenous plant species in their backyards; they are visiting natural areas to experience indigenous biodiversity; backyards across the city are safe for and supporting indigenous wildlife, all Council reserves in Wellington are indigenous wildlife-friendly refuges.



*People are aware of risks to wildlife (including cars and windows) and use readily available information to minimise those risks*



*Indigenous plants are promoted through local nurseries*



*People are aware of the indigenous species around them, and see saddlebacks and bellbirds in their backyards*



*Pests are controlled across Wellington, including in everyone's backyards*



*People are monitoring indigenous wildlife and reporting sightings through mobile apps*



*People make public commitments to be responsible pet owners*

## 8.2 Community Catchments

Wellington is a city of catchments, which have people at their core. Community catchments is about carrying out integrated whole of ecosystem approaches to restoration. Building healthy terrestrial and freshwater ecosystems and strong communities.

Community restoration projects, whether focused on land or streams, will work together on a catchment based approach to enable holistic restoration. Biodiversity will be connected between land and stream, across different reaches of streams and across both public and private land. Individuals will be encouraged and supported to take action, and meaningfully contribute to monitoring the results of those actions.



*Groups within catchments, including mana whenua, work together on restoration and monitoring*



*Streams are found in their natural state and fish can travel throughout our catchments*



*Catchments are covered in indigenous vegetation, and planting creates corridors and stepping stones*



*The use of green infrastructure and water sensitive urban design is commonplace*



*People can access our natural areas and do this on a regular basis*



*Everyone is aware of what activities pollute streams and act responsibly*

### 8.3 Blue Belt

In the same way as Wellington has a green belt, it also has a magnificent harbour and coastline, which interrelates with land to form a “blue belt”. Through highlighting the value and significance of the harbour, Blue Belt can provide education about conserving and restoring marine life.

The Blue Belt will work towards the restoration of the ecology and water quality of our harbour and coast; Wellingtonians and visitors will be aware of the significance of our harbour and coast and the connections to it from the land; multiple collaborations will increase the recognition and restoration of our marine and coastal environment and our harbour and coast and its many values will be celebrated.



*Marine ecological restoration projects are supported, and land based effects on the marine environment researched*



*Organisations work closely together to manage Wellington's marine environment in an integrated way*



*Key habitat for significant species has been identified, and coastal plant collections created*



*Marine education programmes are run collaboratively with our partners*



*People are connected to the marine environment through interpretive signs and sculptures*



*Coastal dune sites are restored through planting programmes and clean ups are supported*



# Part Two: Action Plan and Rationale

## 9. Action plan

In order to establish healthy and resilient indigenous biodiversity within Wellington, we need to focus on certain areas. We need to protect what we have, we need to restore what is degraded, we need to research the requirements of our biodiversity and the best methods for looking after it, and we need to connect people to it.

These actions are covered under the following areas: protect, restore, connect and research.

Many of the actions will be funded through budgets developed for the relevant asset management plans and annual plans.

Other actions will be funded through alternative budget sources. This means funds will be sought from sources such as sponsorship and grants in liaison with key internal and external partners such as government agencies, educational institutes and non-government-organisations. The actions outlined in this plan will be prioritised as part of Wellington City Council's planning and budgeting processes and itemised into work programmes.

Funding:	Priority:	Time frame for completion:
N = New funding required	1 = Action essential to success of plan	Ongoing
E = Existing funding	2 = Action important to the success of plan	Short (1-3 years)
Ex = Expansion of existing funding or reprioritisation within existing resources	3 = Action useful to the success of the plan	Medium (3-5 years)
		Long (5-10 years)

### 1. PROTECT

#### GOAL 1.1 - Priority biodiversity sites on public and private land are protected

Objectives	Actions	Funding	Priority	Timeframe
1.1.1 Protect all areas of ecological significance on Council-owned land through active management, working with partners such as Greater Wellington Regional Council (GWRC)	a. Ensure that all ecologically significant areas on Council-owned land are vested as reserves	E	1	Ongoing
	b. When reviewing or preparing reserve management plans, ensure that biodiversity is recognised and provided for	E	1	Ongoing
	c. Create ecological management plans for all areas of ecologically significant public land, linking with local community groups, GWRC and iwi where applicable	E	1	Long
	d. Develop a master plan for Te Kopahau Reserve	E	1	Short
1.1.2 Identify and protect all areas of ecological significance on privately owned land through District Plan protection	a. Review Conservation Sites listed in the District Plan as part of the DP review	E	1	Short
	b. Include in the District Plan mechanisms to better protect significant ecological areas on private land	E	1	Short
	c. If there is an ecologically significant site on Open Space zoned land, investigate changing that zone to Conservation	E	3	Medium

**Opposite:** Karearea (NZ falcon) are now breeding within Wellington city. This juvenile was seen at Otari-Wilton's Bush. Capable of flying at speeds over 100 km/h, they are a bird of action. Photo: Allan Sheppard

**GOAL 1.2 - Rare, threatened or locally significant species are protected**

Objectives	Actions	Funding	Priority	Timeframe
1.2.1 Work with partners, including the Department of Conservation (DOC), community groups and others, to ensure that no nationally or regionally threatened or locally significant species is lost to Wellington, and ensure that genetic diversity is retained as far as possible	a. Partner with relevant organisations for the in-situ and ex-situ protection of threatened species through the development of action plans for nationally or regionally threatened and locally significant species	E	1	Ongoing
	b. Work with partners to locate and map all nationally or regionally threatened and locally significant species	E	1	Ongoing
	c. Be actively involved in the New Zealand Indigenous Flora Seed Bank by contributing knowledge, seeds and appropriate permits.	E	3	Ongoing
1.2.2 Ensure that animal pest control is sufficient to allow for the survival of nationally or regionally threatened and locally significant species	a. Develop a set of guidelines for animal pest control methods based on the biodiversity outcomes we want to achieve	E	1	Short
	b. Establish the optimal bait station network across our reserve network and the frequency with which this network needs to be maintained	Ex	1	Short
	c. Ensure that animal pest control within a buffer zone around Zealandia is sufficient to allow for successful breeding	Ex	1	Short
	d. Establish criteria and protocols to decide which species within Wellington warrant additional protection if discovered through monitoring programme	Ex	2	Short

**GOAL 1.3 - Pest species are controlled to sufficient levels to protect our biodiversity, and eradicated if possible**

Objectives	Actions	Funding	Priority	Timeframe
1.3.1 Control pest animals and plants that threaten sites of ecological significance	a. Develop a revised pest management implementation plan and review the pest management programme to determine whether the size, scope, scale, intensity and duration are likely to sustain viable populations of key species (including vegetation and processes, birds, lizards, fish and invertebrates) within the Council's open space network and where possible on relevant private land	<i>E</i>	<i>1</i>	<i>Short</i>
	b. Carry out pest control based on priority sites in accordance with ecological significance criteria and priority threats	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	c. Support other organisations carrying out control activities that fit with Council priorities	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	d. Expand the number of hectares of ecologically significant public land under integrated pest control from 52% in 2014 to meet agreed target of 70% by 2020 and 100% by 2025	<i>Ex</i>	<i>1</i>	<i>Long</i>
	e. Identify and address gaps in the possum control network	<i>N</i>	<i>2</i>	<i>Medium</i>
	f. Adapt the National Pest Control Agency guidelines for ethical and humane practices for animal pest control for use by Council, its contractors and volunteers	<i>E</i>	<i>3</i>	<i>Short</i>

<b>1.3.2</b> Control pest animals and plants with the greatest potential to have adverse impacts on indigenous biodiversity	a. Work with GWRC to maintain a list of Wellington pest plants with the greatest potential to increase their range and pose a threat to areas of ecological significance, and prioritise their control	<i>E</i>	1	<i>Ongoing</i>
	b. Carry out pest control based on priority species with the greatest potential to have adverse impacts, across all public land	<i>E</i>	1	<i>Ongoing</i>
	c. Work with other organisations (including GWRC, DOC, Predator Free NZ, Zero Invasive Predators) to ensure we are using the best methodologies for controlling pest species	<i>E</i>	1	<i>Ongoing</i>
	d. Protect key lizard populations in known high priority areas - review pest control for mustelids, hedgehogs and rodents; particularly in south coast parks such as Red Rocks, Moa Point, Point Dorset, Tarakena Bay and Palmer Head	<i>Ex</i>	1	<i>Short</i>
	e. Continue sustained control of feral goats across the south-west peninsula with the ongoing aim of ultimately eradicating feral goats. Continue to seek more tools including regulatory tools to achieve eradication	<i>E</i>	2	<i>Ongoing</i>
	f. Work closely with the New Zealand Transport Agency (NZTA) and OnTrack to remove significant environmental pest plants from transport corridors not owned by the Council	<i>N</i>	2	<i>Medium</i>

<b>1.3.3</b> Increase the area of land under integrated pest control by supporting landowners, occupiers and community groups to take an active role in controlling pest plants and animals and preventing the spread of pests in the city	a. Support the capacity of new and existing community groups to engage in pest animal and pest plant control	<i>Ex</i>	1	<i>Short</i>
	b. Implement animal pest control in the areas of rural land to the south-west of Zealandia	<i>E</i>	2	<i>Short</i>
	c. Work with other stakeholders to explore the possibility of making Miramar Peninsula pest free	<i>Ex</i>	3	<i>Long</i>

**GOAL 1.4 - The impact of urban growth and human activity on all ecosystems and remaining habitat is managed**

Objectives	Actions	Funding	Priority	Timeframe
<b>1.4.1</b> Ensure that all ecological and recreation values of open spaces are recognised in the District Plan, including for their future potential as part of a city green network, and for the ecosystem services they deliver such as health and wellbeing benefits	a. Identify all sites of ecological significance and sites that are important, or could be, for maintaining or enhancing connectivity between ecologically significant sites.	<i>E</i>	<i>1</i>	<i>Short</i>
	b. Initiate a review of Conservation sites in the District Plan to ensure that all the sites identified in 1.4.1.a on public land (including important buffer zones and corridors) are listed as Conservation Sites or Open Space	<i>E</i>	<i>1</i>	<i>Short</i>
	c. Seek to protect all the sites on private land sites identified in 1.4.1.a through a review of Conservation sites in the District Plan, voluntary agreements and /or acquisition	<i>E</i>	<i>1</i>	<i>Short</i>
	d. Identify areas of road reserve that could be reclassified as reserve and carry out road stopping, where those areas are not needed for roading purposes, they contain forest remnants or significant vegetation over 0.5ha in area and adjoin an existing reserve	<i>N</i>	<i>2</i>	<i>Long</i>
<b>1.4.2</b> Increase regulatory protection through the District Plan provisions for all sites of ecological significance (including ecological linkages) to prevent further clearance and fragmentation	a. Provide specialist ecological advice on District Plan changes and conditions on consents	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	b. Ensure District Plan changes adequately protect biodiversity values through goals, policies and rules	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	c. Monitor regulatory effectiveness to ensure that compliance around biodiversity protection and restoration is achieved	<i>Ex</i>	<i>2</i>	<i>Ongoing</i>

<b>1.4.3</b> Reduce impacts of urban development and land-use on aquatic ecosystems	a. Assist Wellington Water and stakeholders to complete Integrated Catchment Management Plans for Wellington's eight catchments: Lambton Harbour/Oriental Bay, Evans Bay, Island Bay/Houghton Bay, Lyall Bay, South-east Coast, Owhiro Bay, Kaiwharawhara, and Onslow/Ngauranga/Horokiwi	<i>E</i>	1	<i>Ongoing</i>
	b. Work with GWRC and within the Council to ensure no new permanent barriers to fish passage are created through works in streams or stormwater systems where these link significant stream habitat together.	<i>E</i>	1	<i>Ongoing</i>
	c. Ensure that Council chemical use has no net negative impact on aquatic ecosystems	<i>E</i>	1	<i>Ongoing</i>
	d. Build on our relationship with partners working on the protection of the marine environment, focussing on education programmes.	<i>E</i>	1	<i>Ongoing</i>
	e. Retain all streams on reserve land in a natural state	<i>E</i>	1	<i>Ongoing</i>
	f. Under District Plan provisions, and considering the approach set out in Policy 43 of the RPS (protecting the aquatic ecological function of water bodies), prevent any further loss of whitebait spawning sites, and require that any significant works within whitebait spawning areas restores their operation	<i>E</i>	1	<i>Short</i>
	g. Integrate best practice WSUD into Council projects	<i>E</i>	2	<i>Ongoing</i>
	h. Complete mapping of streams as part of asset mapping of all stormwater infrastructure	<i>E</i>	2	<i>Short</i>
	i. Develop technical detail of Water Sensitive Urban Design (WSUD) in the Code of Practice for Land Development	<i>E</i>	2	<i>Short</i>
	j. Develop updated guidelines for earthworks on small sites in collaboration with GWRC	<i>E</i>	2	<i>Short</i>
	k. Identify and prioritise streams that should be kept in their natural state and strengthen provisions in the District Plan for their protection	<i>E</i>	2	<i>Short</i>
	l. Ensure there are provisions in the District Plan to protect and enhance riparian strips	<i>E</i>	2	<i>Short</i>
	m. Ensure that all contractors working in and around streams have undertaken sediment control training	<i>Ex</i>	2	<i>Medium</i>
	n. Develop at least one example of best practice WSUD in a high-profile location	<i>N</i>	3	<i>Long</i>

<b>1.4.4</b> Ensure existing biodiversity is conserved and enhanced on proposed development sites	a. Educate and advise landowners and developers around methods for protecting natural values in developments and sub-divisions, including enhancing ecosystems and recreational opportunities through habitat creation, pest control, low-impact urban design and water sensitive urban design	<i>Ex</i>	<i>1</i>	<i>Medium</i>
	b. Develop evidence based guidelines and criteria (working with stakeholders) for trail development on Council owned land to balance recreational needs with ecological values.	<i>E</i>	<i>2</i>	<i>Short</i>
	c. Provide consent officers with access to up-to-date information and interpretation of information so they can make informed decisions	<i>E</i>	<i>2</i>	<i>Ongoing</i>
	d. Investigate the impact of street lighting on biodiversity as part of new developments	<i>E</i>	<i>3</i>	<i>Long</i>
<b>1.4.5</b> Advocate for biodiversity values to be included in all Council plans, strategies and programmes that potentially impact on these values	a. We will incorporate biodiversity principles into Council plans and policies such as the Code of Practice for Land Development, Subdivision Design Guidelines.	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	b. Consider the impact of future climate change on all biodiversity management activities	<i>E</i>	<i>2</i>	<i>Ongoing</i>

**2. RESTORE**

**GOAL 2.1: The loss or decline of our indigenous biodiversity is reversed, and self-sustaining and resilient ecosystems created**

Objectives	Actions	Funding	Priority	Timeframe
<b>2.1.1</b> Create resilient and self-sustaining ecosystems	a. Continue the Council's restoration planting programme of at least 45,000 native eco-sourced plants annually	E	1	Ongoing
	b. Create a city wide planting strategy (including suburban areas and the CBD) to ensure a representative range of sites across the different ecosystems - forest, shrubland, wetland, streamside (riparian), rocky shore and coastal - are included as part of the Council's restoration planting programme	E	1	Ongoing
	c. As part of the strategy, ensure that a mix of plant types is included in the restoration planting programme, including emergent trees, climbers and groundcovers	E	1	Ongoing
	d. Write citywide guidelines for enrichment planting, including where best to source plant propagules, different species' habitat requirements, the importance of mycorrhizal associations, and the most effective methods of propagation	E	2	Short
<b>2.1.2</b> Continue to use eco-sourced plant material and promote it to the wider community	a. Review eco-sourcing guidelines for use in different practical contexts, involving relevant organisations and community groups	E	1	Short
	b. Continue the provision of eco-sourced plants through Berhampore Nursery	E	1	Ongoing
	c. Work with community and private nurseries to ensure they all have seed collection permits and are following eco-sourcing guidelines	E	1	Short

<b>2.1.3</b> Restore the function of ecosystems, recognising the role that all species may play	d. Evaluate the ecological function of large exotic trees on public land and if removals are required (eg for safety reasons), consider replacing that function before removals occur	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	e. Trial ways of restoring native forest underneath a canopy of exotic conifers to build on our knowledge of long term restoration options in these environments	<i>E</i>	<i>1</i>	<i>Short</i>
	f. Initiate a programme to gradually replace over-mature conifers with native vegetation over 20-30 years, in accordance with priorities in existing management plans such as the Wellington Town Belt Management Plan	<i>E</i>	<i>2</i>	<i>Ongoing</i>
	g. Ensure that future Council amenity and landscape planting (including street trees) will not threaten indigenous biodiversity, and enhance indigenous biodiversity where practicable	<i>E</i>	<i>2</i>	<i>Ongoing</i>
	h. Trial the practice of damaging weed trees where appropriate and leaving them standing (veteranisation) to create cavities for birds, lizards and insects	<i>Ex</i>	<i>2</i>	<i>Short</i>

**GOAL 2.2: Aquatic ecosystem health across the city is improved**

Objectives	Actions	Funding	Priority	Timeframe
2.2.1 Continue stream restoration programmes in accordance with community and catchment priorities	a. Continue streamside (riparian) planting programme (including indigenous vegetation buffers)	E	1	Ongoing
	b. Identify and prioritise streams that should be restored from their current state	E	1	Short
	c. Support or seek funding with agencies such as Million Metre Streams, supporting community groups to apply for funding via these organisations	E	1	Short
	d. Ensure all Council works in stream are in accordance with GWRC best practice guidelines.	E	1	Ongoing
	e. Conduct walkover of Kaiwharawhara, Owhiro and Haape streams to map and identify barriers to fish passage	N	1	Short
	f. Seek to restore (daylight) piped sections of stream within large natural catchments to contribute to overall stream network health	E	2	Ongoing
	g. Prioritise barriers to fish passage and schedule their modification or removal as part of an annual programme	N	2	Medium
	h. Support Zealandia to explore the eradication of pest fish within the lakes and streams of the valley	E	2	Medium
	i. Work with local farmers to fence and plant riparian areas on their land.	N	2	Long

**GOAL 2.3: Restoration programmes are in place for rare, threatened or locally significant species**

Objectives	Actions	Funding	Priority	Timeframe
<b>2.3.1</b> Ensure threatened fauna has the habitat needed to complete lifecycles	a. Plant food species for threatened fauna as part of restoration planting programmes	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	b. Install suitable nesting sites for cavity nesting species in reserves where these species are known to be present.	<i>N</i>	<i>2</i>	<i>Short</i>
<b>2.3.2</b> Re-establish populations of threatened plants in Wellington	a. Propagate threatened species at Council nurseries for planting as part of the restoration planting programme	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	b. Work with community and professional nurseries on the propagation of threatened species	<i>E</i>	<i>1</i>	<i>Ongoing</i>
<b>2.3.3</b> Work in partnership with other organisations to develop species restoration programmes for both terrestrial and aquatic species	a. Work with DOC to ensure the Council is following 'threatened species recovery plans' where these are in place	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	b. Support other organisations with restoration programmes where these are already in place	<i>E</i>	<i>2</i>	<i>Ongoing</i>
	c. Consult other organisations to ensure current species restoration programmes are being followed	<i>E</i>	<i>2</i>	<i>Short</i>
	d. Work with relevant organisations to investigate the restoration of indigenous fauna through reintroduction programmes	<i>N</i>	<i>2</i>	<i>Medium</i>

**GOAL 2.4: Ecological networks are developed across the landscape**

Objectives	Actions	Funding	Priority	Timeframe
<b>2.4.1</b> Create connections between reserves for key plant and animal species (ie create a Green Network Plan)	a. Identify key species for which connections would be beneficial and can be achieved	<i>E</i>	<i>1</i>	<i>Short</i>
	b. Identify individual dispersal mechanisms and requirements for each of these key species and where current populations are located	<i>E</i>	<i>1</i>	<i>Short</i>
	c. Carry out restoration planting and strategic street planting where practicable to allow for travel of these key species between core areas	<i>E</i>	<i>2</i>	<i>Medium</i>
	d. Prepare a discussion paper on roadside reserves as potential corridors between remnants	<i>E</i>	<i>2</i>	<i>Medium</i>
	e. Work with private landowners to close gaps between identified ecologically significant areas where the reserve network is not sufficient	<i>N</i>	<i>2</i>	<i>Long</i>
<b>2.4.2</b> Work with private landowners to restore areas of ecological significance	a. Assist landowners with seeking grants to fund the ecological restoration on sites with identified ecologically significant areas	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	b. Identify and prioritise the areas of private land that contain large areas of prime and secondary forest remnant or wetlands and work with landowners of these sites on restoration programmes	<i>E</i>	<i>1</i>	<i>Short</i>
	c. Give advice to private landowners on restoration planting	<i>E</i>	<i>2</i>	<i>Ongoing</i>
	d. Work with QEII to protect ecologically significant sites on private land	<i>Ex</i>	<i>2</i>	<i>Short</i>
	e. Identify, create and implement incentives to get people to care for biodiversity on private land	<i>Ex</i>	<i>2</i>	<i>Medium</i>
	f. Work with private landowners to create ecological restoration plans for areas of ecological significance	<i>Ex</i>	<i>2</i>	<i>Long</i>
<b>2.4.3</b> Work with Porirua City Council, Lower Hutt City Council, GWRC and DOC to ensure cross-boundary management of important catchments and ecosystems	a. Work with Porirua City Council, GWRC and Ngāti Toa on the implementation of the Porirua Harbour Strategy	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	b. Work with GWRC on the establishment and implementation of the Porirua and Wellington Harbour Whaituas	<i>E</i>	<i>1</i>	<i>Short</i>
	c. Work with GWRC to identify the spread of species between Belmont Regional Park and Council Northern reserves	<i>Ex</i>	<i>3</i>	<i>Medium</i>

### 3. CONNECT

#### GOAL 3.1: Biodiversity is a common experience for all Wellingtonians

Objectives	Actions	Funding	Priority	Timeframe
3.1.1 Ensure all Wellingtonians encounter nature on a daily basis	a. Promote and increase use of native plantings in Council amenity planting, particularly within the central city	<i>E</i>	1	<i>Ongoing</i>
	b. Investigate the use of live feed cameras on bird nests (eg kaka and/or little blue penguin, and/or underwater marine environment in inner harbour) and promote these images to the public	<i>N</i>	2	<i>Medium</i>
	c. Increase the number of large trees planted in the central city, focussing in particular on the east-west connections. Explore the use of suitable local native tree species.	<i>Ex</i>	2	<i>Long</i>
	d. Make green infrastructure and water-sensitive urban design (WSUD) standard as part of new buildings and upgrades within the Council property portfolio	<i>N</i>	2	<i>Long</i>
	e. Incorporate indigenous biodiversity into Wellington's urban design strategies	<i>E</i>	3	<i>Medium</i>
	f. Include New Zealand nature and natural imagery into public space upgrade projects	<i>E</i>	3	<i>Medium</i>
	g. Install green roofs and walls on at least one public building in the central city and surrounds	<i>N</i>	3	<i>Medium</i>
3.1.2 Ensure Wellingtonians connect with nature as part of recreation activities	a. Ensure all Wellingtonians in suburban and urban areas can access a natural space within a 10-minute walk or cycle	<i>E</i>	1	<i>Ongoing</i>
	b. Support the development of community gardens and edible planting groups	<i>E</i>	2	<i>Ongoing</i>
	c. Restore natural areas near key recreational areas such as sportsfields and playgrounds	<i>E</i>	2	<i>Medium</i>
	d. Promote cycling and walking links through and along the appropriate green and blue networks	<i>E</i>	3	<i>Ongoing</i>
	e. Ensure legal protection over private land provides for public access where practicable	<i>E</i>	3	<i>Ongoing</i>
	f. Promote and protect areas which provide tranquil green space to assist with mental health and wellbeing	<i>N</i>	3	<i>Long</i>

**GOAL 3.2: People understand the importance and value of biodiversity to their wellbeing**

Objectives	Actions	Funding	Priority	Timeframe
<b>3.2.1</b> Raise Wellingtonians' awareness of the significance and value of biodiversity	a. Educate the public around Council use of indigenous vegetation to increase community awareness and appreciation of local plants eg through Otari-Wilton's Bush, garden beds and traffic island displays; identify suitable indigenous species for specimen planting where appropriate	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	b. Celebrate our indigenous biodiversity and our successes in relation to its conservation	<i>E</i>	<i>2</i>	<i>Ongoing</i>
	c. Create and install interpretive signage within key reserve areas to educate people about the biodiversity values of that area	<i>N</i>	<i>2</i>	<i>Ongoing</i>
	d. Create and install interpretation materials telling stories of cultural and natural history and promoting community restoration initiatives	<i>N</i>	<i>3</i>	<i>Long</i>
<b>3.2.2</b> Use technology to connect people with biodiversity and ensure that people have access to current information on biodiversity	a. Inform and educate the public through a number of activities and programmes, including production of communications such as our e-newsletter Branch Out	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	b. Promote Nature Watch as a citizen science tool to collect information on biodiversity and environmental pest species	<i>E</i>	<i>2</i>	<i>Ongoing</i>
	c. Have all biodiversity information and research available through the Council website	<i>E</i>	<i>2</i>	<i>Medium</i>
	d. Develop an easily used species identification guide for lizards and implement standardised lizard reporting procedures	<i>E</i>	<i>3</i>	<i>Short</i>
	e. Create a physical public research hub where the community can access research advice and reference collections	<i>N</i>	<i>3</i>	<i>Medium</i>
	f. Develop smart and easily accessible information to enable people to access areas of high biodiversity, including smart phone applications and interactive mapping	<i>E</i>	<i>3</i>	<i>Medium</i>

3.2.3 Give children and youth the opportunity to experience and learn about nature	a. Create the Children's Garden at the Wellington Botanic Garden to fire the imagination of children and inspire adventures	<i>N</i>	<i>1</i>	<i>Short</i>
	b. Create opportunities for schools to get involved in conservation initiatives and edible planting and identify which schools are near to reserves that could be "adopted"	<i>E</i>	<i>1</i>	<i>Short</i>
	c. Identify and promote outdoor recreation opportunities for children and youth	<i>E</i>	<i>1</i>	<i>Short</i>
	d. Continue to produce educational resources at Otari-Wilton's Bush to enhance visits by schools and other interested parties	<i>E</i>	<i>2</i>	<i>Ongoing</i>
	e. Where appropriate and aligned with our strategy, continue support for environmental education programmes eg Enviroschools, Wellington Zoo's Bush Builders programme and the Zealandia education programme	<i>E</i>	<i>2</i>	<i>Ongoing</i>
	f. Review the Council's environmental education approach and develop a more coherent approach to working with children, schools and other environmental education providers	<i>E</i>	<i>2</i>	<i>Short</i>
	g. Create at least one natural playscape and use natural elements in other playground upgrades	<i>N</i>	<i>2</i>	<i>Medium</i>

**GOAL 3.3: More people are connected to nature, so take action to protect and restore biodiversity**

Objectives	Actions	Funding	Priority	Timeframe
<b>3.3.1</b> Promote responsible pet ownership to protect wildlife in our open spaces	a. Review the animal control bylaw and use it to minimise the impact of pets on native biodiversity	E	1	Short
	b. Work with partner organisations to reduce the impact of cats (domestic, stray and feral) on our indigenous wildlife.	N	1	Short
	c. Work with communities in high biodiversity risk areas on how best to minimize or avoid impacts of cats and dogs on indigenous biodiversity.	N	1	Short
	d. Run education and awareness programmes to encourage people to desex cats and keep them indoors as much as possible	N	1	Short
	e. Investigate subsidising microchipping for cats near sensitive wildlife areas as a voluntary approach	E	1	Short
	f. Work with partners to run a behaviour change programme informing people of the need to keep dogs on leashes near sensitive wildlife areas to protect ground dwelling/nesting birds, such as coastal penguin habitat and in forests during crucial fledging periods	N	1	Medium
<b>3.3.2</b> Promote enhanced biodiversity awareness in all Council practices	a. Work with all Council business units and Council controlled organisations to have input into relevant Council standards and policy	E	1	Ongoing
	b. Run at least one internal training programme per year on issues relating to biodiversity. These should initially focus on threatened environments such as streams and dunes	E	2	Ongoing
<b>3.3.3</b> Increase active participation in biodiversity projects and celebrate that action	a. Publicise biodiversity projects through Council channels and work with NatureSpace portal to assist people to volunteer and get involved	E	1	Ongoing
	b. Publicise the Council's and other organisations' activities, events and achievements relating to Wellington's biodiversity through social media, media articles and publications	E	1	Ongoing
	c. Promote opportunities for people to participate in decision-making affecting biodiversity (RMA processes, submitting to Council, joining ERG etc)	E	2	Ongoing

<b>3.3.4</b> Engage the wider community in Citizen Science projects	a. Continue involvement in the annual backyard bird survey and the Kereru Count	<i>E</i>	2	<i>Ongoing</i>
	b. Engage the community in other species-based programmes such as lizard monitoring, potentially using NatureWatch as a tool	<i>N</i>	2	<i>Ongoing</i>
	c. Lead one BioBlitz (terrestrial and aquatic) within Wellington every 3 years	<i>N</i>	2	<i>Short</i>
<b>3.3.5</b> Encourage and support individuals and households to take action to support biodiversity	a. Continue to support annual initiatives with partner organisations that encourage all people to remove weeds from their gardens and plant native plants instead	<i>E</i>	1	<i>Ongoing</i>
	b. Implement an awareness programme about environmental weeds (including native weeds), the impact of garden dumping and risk of birds and wind spreading seeds to nearby parks and reserves	<i>E</i>	1	<i>Short</i>
	c. Encourage people to have wildlife friendly backyards by providing information on creating habitat and planting food species.	<i>E</i>	1	<i>Short</i>
	d. Promote backyard trapping by providing information and facilitating the supply of equipment	<i>N</i>	1	<i>Short</i>
	e. Develop and publish plant lists and guides for zones around Wellington (based on species that originally grew there) so people can be informed about the appropriate species to plant	<i>E</i>	1	<i>Short</i>
	f. Work with partners (including Wellington Water) to provide and promote information on the impact of household activities, such as car washing and the use of paint and chemicals, on water pollution	<i>Ex</i>	2	<i>Ongoing</i>
	g. Investigate possible options to get more green waste from the city going to the compost facility at the Southern Landfill	<i>Ex</i>	2	<i>Medium</i>
	h. Work with community partners to establish a teaching garden to educate people on the difference between similar plant species (both weed and native)	<i>Ex</i>	2	<i>Medium</i>
	i. Work with the community to explore options for chemical free pest control and recommend chemical free approaches for small scale operations	<i>E</i>	3	<i>Medium</i>

**GOAL 3.4: We work with a range of partners towards a shared vision for Wellington's biodiversity**

Objectives	Actions	Funding	Priority	Timeframe
<b>3.4.1</b> Work in partnership with iwi and other Māori groups	a. Ensure local mana whenua have the opportunity to be involved in conservation initiatives	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	b. Identify areas of traditional Māori use and biodiversity value, and work with iwi to conduct an assessment of biodiversity sites of cultural significance	<i>E</i>	<i>2</i>	<i>Medium</i>
	c. Identify opportunities on Council parks and reserves where rongoa Māori can be celebrated, plants labelled and interpretation provided	<i>E</i>	<i>3</i>	<i>Medium</i>
	d. Identify opportunities on Council parks and reserves where species required for raranga can be cultivated eg pa harakeke	<i>E</i>	<i>3</i>	<i>Medium</i>
	e. Explore opportunities to use appropriate traditional structures and buildings in our interpretation (for example pou whenua, waharoa	<i>E</i>	<i>3</i>	<i>Long</i>
<b>3.4.2</b> Collaborate with partners to achieve agreed goals, effectively utilising resources and creating strong partnerships	a. Continue relationships between organisations with a strong biodiversity focus, such as Wellington Zoo, WWF-New Zealand, Zealandia and Forest & Bird	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	b. Partner with other agencies to support the NatureSpace portal for community restoration work	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	c. Continue to support Restoration Day	<i>E</i>	<i>1</i>	<i>Ongoing</i>
	d. Facilitate discussions to agree a shared direction for Wellington region's biodiversity outcomes with partners to ensure efficiencies by not duplicating work and responsibilities	<i>E</i>	<i>1</i>	<i>Short</i>

<b>3.4.3</b> Work with partners to identify opportunities for increased business involvement and support	a. Pursue opportunities for business involvement and partnerships including sponsorship, planting programmes, encouraging sustainable business practices. Support and encourage corporate volunteer programmes	<i>E</i>	2	<i>Ongoing</i>
	b. Develop guidelines with other organisations that use corporate volunteers, such as DOC and GWRC, to establish in which sites corporates should engage	<i>E</i>	2	<i>Medium</i>
<b>3.4.4</b> Support and build the capacity of existing and new community groups engaging in biodiversity projects	a. Continue the Living City grants scheme with an ongoing financial commitment of at least \$80,000 per annum to support projects on public and private land that have biodiversity benefits for Wellington	<i>E</i>	1	<i>Ongoing</i>
	b. Continue to provide at least 34,000 native eco-sourced plants annually to the community	<i>E</i>	1	<i>Ongoing</i>
	c. Continue support for environmental restoration groups through the provision of plants, materials, technical advice and in-kind support	<i>E</i>	1	<i>Ongoing</i>
	d. Develop an annual programme of training and workshops to complement Restoration Day (in partnership with DOC, GWRC and NGOs)	<i>E</i>	1	<i>Short</i>
	e. Facilitate the establishment of a community plant nursery network to promote best practice, access to training opportunities and cooperation	<i>E</i>	1	<i>Short</i>
	f. Ensure information on funding sources is available for community groups to carry out biodiversity conservation work. Promote funding sources available for private landowners to protect and manage biodiversity on their own land (including carbon credits)	<i>E</i>	2	<i>Ongoing</i>
	g. As part of a city wide planting strategy, identify where groups are working in areas with missing plant species, and ensure those groups have the ability to plant those species	<i>E</i>	2	<i>Medium</i>
	h. Facilitate the coordination between community environmental groups, including potential mergers, to ensure a sustainable community contribution to conservation.	<i>E</i>	2	<i>Ongoing</i>

## 4. RESEARCH

### Goal 4.1: Wellington City Council has increased understanding and knowledge of biodiversity

Objectives	Action	Funding	Priority	Timeframe
4.1.1 Identify and monitor locally important sites and species	a. Ensure that all known populations of threatened plants are captured digitally and monitored	<i>Ex</i>	1	<i>Ongoing</i>
	b. Ensure that staff collect information on new populations of locally important species	<i>E</i>	1	<i>Ongoing</i>
	c. To ensure we have accurate information, re-survey the boundaries of ecologically significant sites	<i>N</i>	1	<i>Short</i>
	d. Conduct a bat survey to establish whether populations are present in Wellington	<i>N</i>	2	<i>Short</i>
	e. Follow up surveys for Ngahere geckos, barking geckos, spotted skinks, Kupe skinks and ornate skinks using more intensive methods in surveyed parks and reserves with good habitat	<i>N</i>	2	<i>Short</i>
	f. Support researchers gathering information on invertebrates	<i>N</i>	3	<i>Medium</i>
4.1.2 Identify habitat requirements for key species	a. Compile information on the nesting requirements for key bird species and work out where species are present with limited breeding habitat	<i>E</i>	1	<i>Short</i>
	b. Compile information on habitat and dispersal requirements for all freshwater fish species	<i>E</i>	1	<i>Short</i>
	c. Compile information on the microhabitat requirements of all threatened plant species	<i>E</i>	1	<i>Short</i>
	d. Establish the dispersal requirements of sensitive forest-dependent species, such as North Island robins	<i>Ex</i>	2	<i>Medium</i>
4.1.3 Ensure the Council has relevant and current information on the requirements of threatened species	a. Establish regular meetings with DOC biodiversity staff to ensure all information on rare, threatened or locally significant species is shared, including reports of dead animals and recent sightings	<i>E</i>	2	<i>Short</i>
	b. Continue to gather knowledge on the threats to threatened species and use this knowledge to adapt management programmes	<i>E</i>	2	<i>Ongoing</i>

**Goal 4.2: Environmental monitoring is consistent across the city, region and country and informs our biodiversity management**

Objectives	Actions	Funding	Priority	Timeframe
4.2.1 Follow international best practice for citywide biodiversity monitoring	a. Carry out the City Biodiversity Index (see 10.1) and put information on Council website. Re-evaluate every 5 years to monitor progress.	<i>E</i>	<i>1</i>	<i>Short</i>
4.2.2 Monitor biodiversity indicators and outcomes in collaboration with partners	a. Set up consistent terrestrial outcomes monitoring framework and annual programme (incorporating existing monitoring work) in a collaborative approach with other key organisations - to include vegetation monitoring, bird monitoring, lizard monitoring	<i>Ex</i>	<i>1</i>	<i>Short</i>
	b. Set up consistent biosecurity output monitoring to evaluate effectiveness of pest animal and plant control programmes	<i>N</i>	<i>1</i>	<i>Short</i>
	c. Ensure common indicators for biodiversity monitoring are used so data can be easily aggregated	<i>E</i>	<i>1</i>	<i>Short</i>
	d. Carry out a monitoring programme for Wellington's streams using the Macroinvertebrate Community Index (MCI)	<i>N</i>	<i>1</i>	<i>Medium</i>
	e. We will work with Greater Wellington Regional Council to monitor the abundance and distribution of high threat Regional Pest Management Plan pest plants on public land	<i>Ex</i>	<i>2</i>	<i>Medium</i>
	f. Work with other organisations to establish monitoring techniques suitable for community groups and individual landowners	<i>E</i>	<i>2</i>	<i>Short</i>
	g. Establish best practice monitoring for urban environments	<i>Ex</i>	<i>2</i>	<i>Medium</i>
	h. Set up permanent 20x20 forest plots in reserves across the city and a programme to reevaluate current plots	<i>E</i>	<i>2</i>	<i>Medium</i>

4.2.3 Monitor effects of stormwater runoff on the freshwater and marine environment	a. Work with Wellington Water to implement the global discharge consent	E	1	Ongoing
	b. Work with Hutt City Council to support GWRC's Wellington Harbour sediment investigation monitoring looking at levels of sediment build-up and effects on biodiversity	E	2	Ongoing (every 5 years)
	c. Support research through Victoria University Coastal Ecology lab on the effects of heavy metals and sediment on the marine environment	N	2	Medium

4.2.4 Set up systems to ensure monitoring information is used to improve management of biodiversity, taking climate change into consideration	a. Continue review of Council restoration programmes through monitoring planting success	E	1	Ongoing
	b. Continue review of environmental weed species and their spread in Wellington through weed mapping	E	1	Ongoing
	c. Carry out research on indigenous tree species to determine suitability for specimen and street tree planting	E	2	Medium
	d. In order to obtain information on predator presence, conduct monitoring for pests in all the parks with high numbers of lizard or bird densities and species	N	2	Medium
	e. Monitor the survival of all planted threatened species to improve knowledge of microhabitat requirements	E	2	Ongoing

#### Goal 4.3: We actively seek and share knowledge about Wellington's biodiversity

Objectives	Actions	Funding	Priority	Timeframe
4.3.1 Continually identify and coordinate local research needs	a. Fund university research to work on projects aligned with the Council's urban ecology research needs	Ex	1	Short
	b. Maintain a research database collating all past and potential research topics	E	2	Medium
	c. Work with Victoria University and Zealandia to develop a centre of excellence in ecological restoration, and encourage and publicise research with a purpose	E	2	Long

4.3.2 Establish a biodiversity network for information sharing	a. Facilitate discussions with key people to decide the best method for interagency cooperation and collaboration on biodiversity related matters, and ensure the implementation of an agreed system	<i>E</i>	1	<i>Short</i>
	b. Support initiatives from other organisations on the development of a biodiversity information-sharing mechanism	<i>E</i>	2	<i>Medium</i>

4.3.3 Have one source of information for everyone	a. Capture all high level biodiversity information related to the Council in the GIS system in a way it can be shared with external organisations	<i>E</i>	1	<i>Short</i>
	b. Develop processes so that information available to the public is updated at the same time as other Council databases	<i>E</i>	3	<i>Medium</i>

#### Goal 4.4: Through knowledge we have gained, we are continually improving our biodiversity management

Objectives	Actions	Funding	Priority	Timeframe
4.4.1 Continue to improve our internal expertise and capacity in biodiversity conservation	a. Ensure staff have the ability to set up and monitor forest plots and the ability to carry out rapid vegetation assessment surveys	<i>E</i>	1	<i>Short</i>
	b. Add requirement for 'consideration of impact on indigenous biodiversity' to Council report templates	<i>E</i>	1	<i>Short</i>
	c. Remain informed about the impact of climate change to ensure current species selection is appropriate	<i>E</i>	2	<i>Ongoing</i>

4.4.2 Ensure that the community can get involved in research, including monitoring	a. Facilitate training programmes for community groups that want to carry out monitoring across all terrestrial and aquatic environments	<i>E</i>	2	<i>Short</i>
	b. Develop a meaningful community stream health monitoring programme and a mechanism for the collection and sharing of that information	<i>N</i>	3	<i>Medium</i>

4.4.3 Promote best practice in biodiversity protection locally, regionally, nationally and worldwide	a. Ensure that all knowledge gained through Council programmes is shared through appropriate forums and the Nature Space website	<i>E</i>	1	<i>Short</i>
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## 10. Measuring Wellington City Council's performance

Accurately and openly monitoring biodiversity trends (and the results of actions we are taking) is essential to determine if progress has been made. Performance measures are used to translate goals and objectives into measurable indicators of progress. They are a vital part of an adaptive management approach, and provide useful information for decision makers to evaluate if actions are successful in addressing goals and objectives.

In addition to these performance measures, Council will establish a consistent monitoring framework (see objective 4.2.2) which will bring together existing monitoring and address any gaps.

Performance measures have been divided into two categories, the City Biodiversity Index (which measures outcomes) and Operational monitoring (which measures outputs).

Unfortunately there is limited historical data in some areas available to measure our progress against. In these cases we need to establish baseline information to ensure that our progress into the future can be measured.

### 10.1 City Biodiversity Index

The following indicators are from the City Biodiversity Index<sup>17</sup> and will be used as a baseline measure for the city, and then a measure by which we can assess our progress. The aim is to see an increase in all these indicator measures to increase over time. This index provides high level monitoring to look at long term trends and how we are tracking to achieve our outcomes. City wide bird counts are incorporated into this index, and also reported through Council annual plans.

**This index provides high level monitoring to look at long term trends and how we are tracking to achieve our outcomes.**

<sup>17</sup> Convention on Biological Diversity. User's Manual for the City Biodiversity Index. 2012.



**Above:** We need to ensure we continue to engage with and educate children. Inviting schools along to planting sites is one way of achieving this.

**Opposite:** Streams such as this one in Khandallah Park look beautiful, but we need to monitor the water quality and habitat to ensure that we are meeting our aim of protecting freshwater ecosystems. Photo: Sin Hoi Phang

Indicator	Explanation	How to calculate
1. Proportion of natural areas in Wellington City	Natural ecosystems harbour more species than disturbed ones, hence the percentage of natural areas compared to that of the total city area gives an indication of the biodiversity richness. Natural areas comprise predominantly native species and natural ecosystems, which are no longer, or only slightly influenced by human actions, except where such action is intended to protect or restore native biodiversity.	(Total area of natural areas, restored and regenerated areas) / (Total area of city) * 100%
2. Connectivity between ecological sites	Fragmentation of natural areas is one of the main threats to biodiversity in a city. The fragmentation of natural areas affects species differently. To encourage positive action to increase connectivity or reduce barriers to connectivity, it is more meaningful to measure connectivity rather than fragmented plots. This indicator score can be improved when more of the fragments are connected.	$\frac{1}{A_{total}} = (A_1^2 + A_2^2 + A_3^2 + \dots + A_n^2)$ <p>Where:</p> <ul style="list-style-type: none"> <li>• n is the total number of connected natural areas</li> <li>• A<sub>total</sub> is the total area of all natural areas</li> <li>• A<sub>1</sub> to A<sub>n</sub> are areas that are distinct from each other (i.e. not connected). They may consist of areas that are the sum of two or more smaller patches which are connected (less than 100m apart).</li> </ul> <p>However, exceptions to the above rule includes anthropogenic barriers such as:</p> <ul style="list-style-type: none"> <li>• Roads (15m or more in width; or are smaller but have a high traffic volume of more than 5000 cars per day)</li> <li>• Any other artificial structures that the Council would consider as a barrier</li> </ul>
3. Native biodiversity in built-up areas (bird species)	Cities comprise largely of urban, suburban and rural sites with minimal natural features. However, built-up areas do harbour biodiversity. Some urban, suburban and rural sites have more biodiversity than others. By enhancing certain features in such areas, the biodiversity could improve. Hence, native biodiversity in urban, suburban and rural sites should be an indicator. We have the most data on bird species, therefore this taxonomic group will be used as the indicator. Implementing appropriate measures such as planting, may attract birds into these areas of the city.	The total number of native bird species in built-up areas which includes urban parks, golf courses, private gardens, cemeteries, roadside planting and impermeable surfaces like buildings and roads.

Indicator	Explanation	How to calculate
4. Change in number of native species	Five key taxonomic groups have been selected as "core indicators" – birds, vascular plants, butterflies, lizards and freshwater fish. The indicators will measure the change in number of species over time rather than the absolute number of the species. Conducting more surveys on the target groups will result in the finding of and reintroducing 'extinct' native species would help to increase the number of extant native species.	Once a baseline has been established, net change in species from one survey to the next is measured as:  Total increase in number of species (as a result of rediscovery, new species found, re-introduction) minus the number of species that have gone locally extinct
5. Proportion of protected natural areas	Protected or secured natural areas indicate the city's commitment to biodiversity conservation. The definition of protected natural areas includes legally protected, formally secured areas, and other administratively protected areas.	$(\text{Area of protected or secured natural area}) / (\text{Total area of the city}) * 100\%$
6. Climate regulation: carbon storage and cooling effect of vegetation	Two important aspects of climate regulation are carbon storage and cooling effects provided by vegetation, in particular tree canopy cover. Canopy cover of trees, which includes those that are naturally occurring and planted, is accepted as an indirect measure of the carbon sequestration and storage services. The extent of tree canopy cover can also act as a proxy measure for filtering of air and numerous other biodiversity benefits.	Tree canopy cover can be measured via satellite and LIDAR imagery.  $(\text{Tree canopy cover}) / (\text{Total terrestrial area of the city}) * 100\%$
7. Amount of accessible green space	Biodiversity provides invaluable recreational, spiritual, cultural and educational services. It is essential for physical and psychological health. This measure ensures social equity within the community with regards to equal access to natural areas	$(\text{Area of parks and reserves with natural areas}) / 1000 \text{ persons}$
8. Proportion of invasive exotic species (as opposed to native species)	Exotic invasive species are species whose introduction and/ or spread threaten biodiversity. It is inevitable in cities, which are open to external influences, to have exotic species. Exotic species which are not invasive or detrimental to native species are not considered in this indicator. In fact in many cities, exotic species enhance the diversity.	To ensure that the comparison of invasive exotic species with that of native species is meaningful, it needs to be a comparison of identical taxonomic groups. Therefore for this measure we will look at vascular plants and bird species.  $(\text{Number of invasive exotic species}) / (\text{Number of native species}) * 100\%$

Indicator	Explanation	How to calculate
9. Regulation of the quantity of water	Climate change is in many places predicted to result in increased variability in precipitation which in urban landscapes translates to high peaks in water-flow and damage to construction, business and transport. Open space and vegetation has a significant effect in reducing the rate of flow of water through the urban landscape. This indicator looks at the proportion of all permeable areas to the total terrestrial area of the city.	Proportion of all permeable areas (including areas identified in Indicator 1 plus other parks, roadside greenery, green roofs, private gardens, streams etc) to total terrestrial area of the city (excluding marine areas and artificial permeable surfaces)  (Total permeable area) / (Total terrestrial area of the city) * 100%
10. Number of formal education visits per child to natural areas	Involving our young people with nature is an essential part of achieving our goals. This measure gives an indication of school children's use of recreational services provided by ecosystems and ensures that our green spaces are being utilised by formal education providers.	Number of formal education visits per child below 16 years to parks and reserves with natural areas.  The Council will have to work with schools to gather information on this measure.
11. Number of biodiversity projects implemented by the city annually	This indicator measures the number of biodiversity related projects and programmes that the Council is involved in, either as the main player or in partnership. Projects could include those about species conservation, biodiversity surveys and restoration projects. For a project or programme to be included in this indicator, biodiversity must be an important consideration. A programme designed to conserve non-native species, but threatened elsewhere, can also be considered.	Total number of programmes and projects that are being implemented by the Council or in partnership or support of the Council.  This list will then be categorised by type into projects and programmes that are: <ul style="list-style-type: none"> <li>• Biodiversity related</li> <li>• Ecosystem services related</li> </ul>
12. Number of organisations/ companies/NGOs/ academic institutions with which the city is partnering in biodiversity activities, projects and programmes	As it is impossible for any single agency to carry out all the activities, responsibilities, projects and programmes that have biodiversity implications, it is inevitable that engagement of all levels of the population must be facilitated. This measures the extent of informal and/or formal partnerships, or collaboration with other entities. Such partnerships should have substantial and long-term involvement from the Council.	Total number of organisations/ companies/ NGOs/academic institutions with which the city is partnering in inter-agency cooperation around biodiversity activities, projects and programmes
13. Number of outreach or public awareness events held in Wellington City per year	The event should either be organised entirely by the Council, or there should be a heavy involvement of the Council before the event to be considered for inclusion in the indicator. Events that just take place within Wellington city with no Council involvement or support will not be considered as part of this indicator.	Total number of outreach or public awareness events held in Wellington city per year

## 10.2 Operational monitoring

These are short term output measures tracking on-the-ground implementation of management actions. Outputs measure activities carried out in order to reach outcomes. The following table shows the progress that has been made since the 2007 Wellington City Council Biodiversity Action Plan, the situation in 2014 when Our Natural Capital was written and the targets we want to reach by the time this plan is scheduled for review in 2020.

Measure	2007 (actual)	2014 (actual)	2020 (target)
Ecological management plans created per year for sites with significant biodiversity value	0	4 per year	All significant ecological sites
Native plantings undertaken by the Council annually*	43,000	45,000	45,000
Survival of plants in Council plantings	65%	77%	90%
Native plants provided annually by the Council for community planting*	27,160	34,000	40,000
Number of enrichment species available for restoration planting	200	1000	2000
Total plants planted in Wellington for ecological restoration	700 000	1 240 000	2 000 000
Amount of land under active weed control (number of sites and hectares)	25 sites	75 sites	85 sites
	No information	570ha	1000ha
Reserves surveyed for high threat Regional Pest Management Plan pest plants on public land	25	50	85
Integrated pest control on Council reserve land (both weed control and control of at least two animal pests)*	No information	52%	70%
Number of sites where animal pest species are monitored	3	3	20
Number of behaviour change programmes (to address behaviour that has a negative impact on biodiversity) per year	0	1	2
Hours worked by environmental volunteers*	7,500	34,611	55,000

Our Natural Capital - Biodiversity Strategy and Action Plan will undergo a comprehensive review, with community consultation, after 5 years, and the action plan updated.

\* LTP measures



# 11. Rationale for goals, objectives and actions

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This section explains the reasoning behind the actions we are taking to achieve our vision. As with the action plan, it is organised into the four themes of protect, restore, connect and research.

This section is important to ensure that everyone understands the rationale behind the decisions we are making. We are dependent on our partners and community in assisting us to achieve our vision. To work collaboratively with them, and be leaders in this area, we need to explain why we have come to the conclusions that we have.

There are also guidelines within this section. While actions are specific and have measurable timeframes, the guidelines in this section inform how the Council will operate while carrying out those actions. These guidelines are for the Council and will be implemented throughout the Council's activities.

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To work collaboratively with them, and be leaders in this area, we need to explain why we have come to the conclusions that we have.

## 11.1 Protect

### 11.1.1 Introduction

The current state of our indigenous biodiversity is a legacy of human settlement and subsequent land-use changes. Much of Wellington's original habitat has been lost and altered beyond recognition. As a result there are now only small remnants that still resemble their original state. These are all modified to some extent, influenced by human processes and introduced animals and plants, many of which pose an ongoing threat. Although there has been a change in attitude to the environment, there are still a number of ongoing threats to indigenous biodiversity. This strategy recognises that we need to address these threats if we are to halt the decline of indigenous biodiversity in Wellington, and sets priorities for its protection. Our priorities for the sites we protect will be decided using our ecological significance criteria (Appendix 2). The strategy uses the Pressure-State-Response framework to identify and address threats.

- **Pressure** - Human activities exert pressures on the environment, changing both its quality and the quantity of natural resources.
- **State** - These changes alter the state, or condition, of the environment.
- **Response** - The human responses to these changes include any organised behaviour or policy that aims to reduce, prevent, or mitigate undesirable changes.

### 11.1.2 What do we need to protect biodiversity from?

#### 11.1.2 (a) Environmental pests

##### Pressure and state

Environmental pests (Appendix 6) are one of the greatest pressures on indigenous biodiversity. Pest animals have a negative effect on native species - including birds, reptiles and invertebrates - impacting ecosystems through predation and competition, as well as browsing damaging native vegetation. Pest plants can alter ecosystems, displacing native species, preventing natural succession and, in some cases, leading to canopy collapse. Amenity weeds are those

that occur in such areas as sports fields, play areas, streets or civic gardens and are not the subject of this strategy except where they overlap with legal requirements for control.

### Plants

Approximately 11 percent (2068 species) of all plants introduced to New Zealand have become established in the wild. Many of the 24,700 introduced species present could establish in the wild in the future. The greatest source of new pest plants is garden escapes and dumping of garden waste (it is estimated that 75 percent of terrestrial and 50 percent of freshwater weeds became established in this way). There are a number of pathways for pest plant spread and these will be considered by GWRC's Regional Pest Management Plan (RPMP). Roads and railways are one pathway for infestation.

Pest plants pose a threat to native ecosystems as they can out-compete and prevent natural succession of native species. Replacement of native plant communities by exotic communities can isolate populations, reducing genetic variability. Closely related exotic species can hybridise with indigenous species (such as South African iceplant (*Carpobrotus edulis*)). Non-local indigenous species can also be invasive. Karo (*Pittosporum crassifolium* and *P. ralphii*), karaka (*Corynocarpus laevigatus*), houpara (*Pseudopanax lessonii*) and pohutukawa (*Metrosideros excelsa*), all native to the northern North Island, have been introduced to the Wellington area and in some locations they are altering local plant communities.

To determine management options relating to pest plants and other exotic species, a number of factors need to be considered. Some exotic or non-local species have cultural or historic associations that will influence their management in specific sites or circumstances. For example, some karaka groves are culturally significant for local iwi and therefore protected. The value of some non-native species also needs to be recognised in providing valuable food and habitats for native species.

### Animals

New Zealand also has a large number of introduced animal species - some of which are invasive and pose a significant threat to native ecosystems. These include mustelids (stoats, ferrets and weasels), possums, rats, hedgehogs, mice, cats and browsers such as goats, pigs, deer and rabbits.

These species pose a serious threat to native fauna. They find easy food in native ground and cavity-nesting bird species including saddleback, kakariki and kaka. Mustelids, possums, rats, cats and hedgehogs all predate on eggs, chicks, lizards and invertebrates. Mice feed on lizards and invertebrates. Of the mustelids stoats pose the greatest threat as they occupy a broader range of habitats and breed more quickly. Possums, rats and mice also consume vegetation and seeds, altering the composition of indigenous plant communities, and compete with native species for food. Browsers consume large quantities of vegetation thereby changing the structure of plant communities, preventing regeneration and, in some cases, resulting in removal of vegetation and the compaction of soils - aggravating erosion and creating sites for weed invasion.

Some introduced birds compete with indigenous species for resources, such as eastern rosella. Introduced fish, including brown trout, threaten freshwater ecosystems through predation, competition and habitat alteration. There are also a number of introduced invertebrates that pose a threat, including German and common wasps and Argentine ants.

There are a number of trends, such as increased temperature through climate change, which may increase the risk of new pest plants and animals becoming established in Wellington and making existing species harder to control. But there will also be opportunities offered by national and local innovations, and the continual development of new tools and techniques in pest management.

### Response

The Council controls a range of pests on its land in accordance with its responsibilities under the National Pest Plant Accord, the Regional Pest Management Plan (RPMP) and other statutory responsibilities. Our primary focus for pest plants in recent years has been the control of species identified under the RPMP as the responsibility of landowners, specifically old man's beard, cathedral bells, wild ginger and banana passionfruit, as well as site-led management at sites of ecological significance. The sites may be whole sites such as a reserve, several sites in close proximity and with similar values, or the sites might be part of a bigger site with areas of lesser biodiversity value that are lower in priority for management, such as primary remnant forest in a larger park.

Species will be prioritised for control in accordance with their ability to cause significant damage within each site and the sites are prioritised in accordance with the criteria in Appendix 2. Weeds are then prioritised for each site by tier (climbers, groundcovers then woody weeds) and feasibility of control. The site focus within particular reserves will be on sites of highest ecological value, under high threat, areas currently under a restoration

programme or areas which have undergone previous control (where we don't want to lose the gains made). Each site will require its own specific programme to control the pests identified through the ranking process. Each site will be different and each programme will reflect those differences and reflect the control techniques required for each identified pest. Weed species may need the attention of specialist operators, for example large trees need to be treated by qualified arborists. Other factors such as weather, budget and labour resources will also have an influence on the methodology and timing of the programmes.

Council will assist with the eradication or control of pest species listed by GWRC as 'Total Control Species'. We will control pests on land that we own or occupy (including roadside verges for which we are responsible) in accordance with the RPMP rules. We will control species that occur on and threaten sites that are considered ecologically significant. We do not have authority to control weeds on private land without the permission of the land owner. In some instances we will gather this information as part of weed mapping to keep a watching brief on the spread and new incursions of weed species.



**Above:** This kaka chick from Huntleigh Park was killed by an off leash dog shortly after this photo was taken. We need to work with people to ensure their pets do not pose a threat to native fauna. Photo: Bernard Smith

Wellington City Council funds possum control work across most of the city. They are controlled in partnership with GWRC within a portion of their three Key Native Ecosystem areas. Other species have been controlled in response to the needs of specific sites and available funding. Goat control has been carried out in response to growing goat numbers in the south-west of the city, and rabbits have been controlled in localised areas dependent on biodiversity needs. Mustelids are controlled in partnership with the community, determined by community priorities. Rats are currently controlled as by kill to possum control operations, but in some areas Council will be looking at intensifying our network where threatened species are found. Rats will be the target species in some of these instances.

Rodent control on private land is the responsibility of the landowner. Rodent control may be required by Council Environmental Health Officers for public health reasons rather than in accordance with the priorities set for the protection of biodiversity values. Other species which may be controlled by Council for public health reasons as opposed to protection of biodiversity include pigeons and ducks.

### **Approaches to pest control**

The pests to be controlled within a site are those that have the potential to adversely affect the biodiversity values of the site. These are generally the widespread species, but can also include species that are currently localised in distribution but have the potential to become significant in the future. A precautionary approach is used. The best time to eradicate or contain a pest species, if it poses a future threat, is in the early stages of infestation, when populations are small and localised. Control costs at this point are relatively low. The more widespread and established a pest, the more difficult and expensive it is to control.

### **Species led programmes**

Species-led programmes are proactive, concentrating on a specific species throughout the region and what is required to control and restrict that species to minimise future threat. Species-led programmes are particularly relevant in managing weeds and pest

animals in the early stages of establishment, when numbers are low and/or distribution is limited, and there is potential to minimise future control costs and environmental impacts. Species-led management must assess the potential impacts of a species, how fast and how well it establishes and spreads, and how practical it is to eradicate, contain or manage it. Rapid response to a species is the optimum, but factors such as the size of the infestation, ease of control, effectiveness of control methods and the need for the cooperation of other parties will also have an influence. Two priority groups under species led programmes are climbers and wilding trees.

### **Site-led programmes**

Site-led programmes focus on protecting identified values in ecologically significant sites. The focus is not on individual species but on the site, the values within the site and the threats to those values. These may be specific sites of ecological significance and/or rare, threatened or locally significant species. The sites may be whole sites such as a reserve, several sites in close proximity with similar values, or part of a bigger site, such as primary remnant forest in a larger park.

### **Pest control on private land**

Plant and animal pests occur across both public and private land. Where the Council is intensively managing pests on land with significant biodiversity values, it is essential to consider how the reinvasion of these sites from adjoining non-Council land can best be managed. Education of private landowners is one method but is generally a long-term project. There are certain circumstances where Council control of pests on neighbouring land would help prevent re-infestation of Council land and reduce the need for additional pest control. Landowner/occupier consent would have to be obtained to access the land.

A priority is to look at pest control on private land to create buffer zones around our ecologically significant areas. The impacts of private land ownership and the mobility of pest animals make it more difficult to implement, but for effective control of many pest animal species the co-operation of the community is essential.

As new subdivisions are developed, we also have to consider the future threat of garden escapes, introduction of weeds and some pest animals (including domestic cats) into these areas that have previously been only lightly affected. Land uses that disturb or alter the environment also have the potential to open up new areas to invasion by weeds.

### **Integrated pest control**

Consideration must also be given to the impacts of pest control on the environment, and the control of pests should not create opportunities for further and possibly worse pests. Within an urban context, the impact of removing one pest species on the rest of the ecosystem needs to be considered. To achieve integrated pest management, a “suite of pests” approach needs to be considered, targeting multiple pest species at once to bring their levels down together. This is particularly applicable to predators and will assist in avoiding competitor release and mesopredator release.

### **Methods used**

*Agrichemicals* are the main method used for controlling pest plants. Currently this is the chosen method given the scale of land and pest species we need to control, but we recognise this level of chemical use as not desirable and other techniques will be explored over the life of this plan.

*Biological control* is the use of naturally occurring parasites, predators and pathogens to control target species. Biological control is primarily used against pest plants, and is strictly controlled and researched nationally to ensure the agent cannot adversely affect native ecosystems. The benefits of biological control include reductions in the use of chemicals, cost-effectiveness and being highly targeted.

*Vertebrate toxic* agents are primarily distributed through ground control involving a network of bait stations, and are used across most Council land, primarily targeting possums and reducing rodent numbers. They can also be used for localised ground poisoning operations that target rabbits.

*Trapping* is the most effective method for targeting some animal pest species, primarily mustelids and hedgehogs, rats and complements the use of toxins. Trapping is recommended for small scale operations such as in backyards to limit the amount of toxin use. Some species cannot be trapped or poisoned, and hunting is the best option for control. These species include feral goats, pigs, rabbits and hares.

*Fencing* is the most effective means for excluding goats, pigs, deer and livestock from sites with high biodiversity values or where the natural regeneration of native vegetation is the management objective.

### **11.1.2 (b) Habitat loss and fragmentation**

#### **Pressure and state**

Wellington’s urban growth poses a threat to remaining indigenous ecosystems. Although large-scale habitat loss is not the threat it once was, there is a continued loss of indigenous habitat by development, land-use intensification and changes in land-use affecting bush remnants, streams and wetlands. The coastal environment is under pressures from subdivision and use, including existing infrastructure and buildings. There is also high demand for coastal sites for new and expanded infrastructure uses, including further reclamation and aquaculture. These all pose a threat to coastal habitats. The cumulative impact of incremental changes needs to be considered. Wellington’s remaining indigenous forest is particularly fragmented and its streams modified. Some remaining bush remnants on private land currently have limited protection under the District Plan, making them vulnerable. The Wellington Urban Growth Plan anticipates an additional 45,000 residents in the city by 2045. Housing, business and infrastructure demands can have associated direct, indirect and cumulative effects on biodiversity which need to be addressed and avoided or mitigated early in the development process. Some emerging issues to do with urban development are the impact of light and sound on biodiversity. There is increasing evidence from overseas that street lights and lights within parks have negative impacts on plants, animals and their behaviour.

Habitat loss at a small scale may not appear to be significant but can lead to a degradation of wider ecosystem function at a city-wide scale. This can lead to remaining areas being too small to sustain the necessary processes and remove the areas used by mobile species to travel across the landscape. In urban areas, increased development puts more pressure on ecosystems' ability to cope and potentially reduces the effectiveness of the ecosystem services provided by Wellington's natural capital.

#### **Response**

We must promote and invest in actions to reduce the negative impacts of the city's growth and development on the environment, and use a range of regulatory and non-regulatory tools to do this. There are a myriad of opportunities within Wellington for better management of our infrastructure. The Council's main mechanism for protecting indigenous biodiversity is through the provisions of the RMA 1991. In particular, the preparation of a District Plan that sets objectives, rules and policies that guide land use and the resource consent process. We will seek to strengthen the protection of our biodiversity through the District Plan, focussing on the primary forest remnants, and ensure alignment between the Council's strategies and policies to ensure biodiversity outcomes are achieved alongside economic development and other wellbeing outcomes. We will also look at Council's infrastructure practices to reduce the impact these have on our biodiversity, including the issues of street lighting. In addition to statutory policy and planning mechanisms and the delivery of services, the Council can also achieve its policy objectives to promote the protection of areas of ecological significance on private land through a number of voluntary measures as outlined in the Action Plan.

#### **11.1.2 (c) Aquatic ecosystem degradation**

##### **Pressure and state**

Everything that goes into the stormwater system eventually ends up in our streams or in the harbour. Stormwater management remains a significant issue within built environments, especially as our city grows and the climate changes. Because stormwater

travels from roads and roofs to streams, rivers and seas without treatment, contaminants in stormwater contribute to pollution of the receiving environment. As houses grow larger and sections grow relatively smaller, and with urban intensification, the resulting increase in impervious areas means increased volume and speed of stormwater runoff. Increased runoff and other activities (including stream realignment, piping, damming or creating new urban stormwater discharges) can significantly modify stream habitats.

Aquatic habitats are vulnerable to degradation through heavy metal and microbial pollution, and sediment linked to urban development and increased intensification. Increased areas of impervious surfaces - roads, roofs and car parks - leads to increased peak flow and volume of run-off and increased load on stormwater drains. Stormwater runoff is heavily influenced by surrounding land use and activities. Human and urban activities generate a wide range of contaminants that are often transported in stormwater. When it rains, contaminants are washed off hard surfaces and into stormwater networks. Research shows fairly conclusively that the sources of contamination are from buildings and neighbouring land uses. Roads are contributors, recipients and conveyors of contaminants from adjacent and often extensive contributing areas.

This contamination of stormwater can result in public health risks, close beaches and affect recreation, shellfish gathering, and cultural and tourism values as well as impacting on marine and freshwater ecosystems. Wellington and Porirua harbours, like other coastal environments surrounded by populated areas, receive significant volumes of stormwater with the potential to pollute their ecosystems.

Land development, especially on hill sites, can cause further erosion, resulting in greater sediment loading on aquatic ecosystems. Hydrodynamic modelling of Porirua Harbour indicates sedimentation rates average about 6mm per annum in the Onepoto arm and 9mm a year in the Pauatahanui Inlet. Work has shown that the biggest sediment contribution is from bare land under construction (37 percent), followed by pasture (33 percent) and with urban runoff

contributing the rest (10 percent). Silt is smothering the seabed, affecting seagrass and shellfish beds, and may be depleting the harbour's ability to attract and retain fish. Localised reduction in harbour depths is affecting navigability even for small vessels. These findings reinforce the importance of construction sediment and erosion control, and the need to manage sites in accordance with consent conditions.

Increased sediment affects aquatic ecosystem functioning and sedimentation can affect many miles of stream. Land-based effects from pollution and sediment can have a significant impact on the coastal marine area affecting values associated with the marine environment including recreation, kai moana gathering and cultural values.

Pollution from heavy metals and other chemicals can also affect biodiversity in the freshwater and marine environment. Monitoring conducted by GWRC in 2013/14 shows that water quality in the four streams monitored in the city - Porirua Stream, Makara Stream, Karori Stream and Kaiwharawhara Stream - are degraded having excessively high levels of dissolved phosphorus and (for all but Makara)

nitrogen. Raised nitrogen and phosphorus levels cause algal blooms, impacting on ecosystem health. Cyanobacterial blooms within the lower Karori reservoir are also exacerbated by introduced fish, which has downstream ramifications. Common sources of excess nitrogen and phosphorus include fertilizer, herbicides and pesticides, sewers and septic systems entering the stormwater system, domestic soaps and detergents being disposed of from private properties. These streams also have excessive levels of E. Coli, making them unsafe to swim in. Despite this, the macroinvertebrate index (MCI) in these streams is still excellent to fair - showing that it is not too late to restore the health of these streams. This pollution also affects other species up the food chain, including sea birds and marine mammals such as orca.

#### Response

The Council is planning to address land use and growth impacts on soil, water and biodiversity within catchments as Wellington grows. This needs to happen primarily through planning and policy documents, and as part of Integrated Catchment Management Plans (ICMP) and the Whaitua process being run by GWRC.



**Above:** Blue cod are recovering well since Taputeranga Marine Reserve was formed. They now come out to meet divers.  
Photo: Michael Johnston, Friends of Taputeranga Marine Reserve

An ICMP is a plan that takes a holistic approach to managing the inputs and outputs of a stormwater catchment. An integrated approach means taking a range of factors into consideration - activity and urban development in the catchment, the state of the stormwater and wastewater networks, levels of contamination, flooding - when planning how to improve things. In a broader sense, integrated catchment management planning is a subset of environmental planning. It aims for sustainable, resilient outcomes - the quality of water entering the receiving environment, for example - through joint land and water management. An integrated approach contrasts with one that treats the two elements separately. ICMPs also take into account the cyclical nature of an ecosystem, and use scientific and technical data to understand the natural world.

Both Integrated Catchment Management Plans and the Whaitua process are designed to ensure collaborative development of catchment specific programmes and an integrated approach to the management of land and water resources. This includes impacts on the harbour and coast as well as the streams that run through the city. We need to reduce the environmental impacts of urban

development and transport, while enhancing our existing natural environmental assets - growing our natural capital.

We need to incorporate Wellington's Water Sensitive Urban Design (WSUD) guidelines into relevant Council plans and policy to minimise future effects on our aquatic ecosystems. We will also take the opportunity to incorporate WSUD into infrastructure upgrades and new development to improve the treatment of stormwater runoff within urban catchments. The management of our closed landfills also must ensure that leachate doesn't enter our aquatic ecosystems.

Our coastal areas such as Taputeranga Marine Reserve are significant assets for the Council. Although management is not the Council's direct responsibility, we manage the coastal reserves adjoining the marine environment, footpaths, roads and other infrastructure that impacts directly on marine waters. Supporting, managing and improving the health of biodiversity and the functioning of infrastructure assets neighbouring the reserve is a priority.

Everyone in Wellington, property owner or not, shares a responsibility for keeping stormwater



**Above:** Healthy freshwater is not only beneficial for biodiversity, but also for people to safely interact with our urban streams.

clean. There are many opportunities for education to increase the number of people that are aware of their impacts on our aquatic ecosystems. A recent survey in Porirua Harbour showed that 40 percent of people were not aware that the stormwater network drained untreated to our streams and sea. Existing education programmes can be strengthened, working closely with Wellington Water Limited where joint objectives can be met.

### 11.1.2 (d) Climate change

#### Pressure and state

The effects of climate change on Wellington's indigenous ecosystems are difficult to predict exactly. Ministry for the Environment climate change<sup>18</sup> predictions for the Wellington Region suggest that Wellington City will experience increased temperatures, rainfall and wind, and sea level rise of at least 0.5m over the next 100 years.

This is leading to increased coastal erosion. Increased storm surges and inundation is damaging remaining dunes and other already fragmented coastal ecosystems (coastal turf communities, coastal scrub), as roads and landward development prevent them from adapting to change by "retreating" landward. The capacity of stormwater systems will be exceeded more frequently due to heavy rainfall events leading to surface flooding and increased number of sewer overflows. More frequent and intense rainfall events will lead to more erosion and landslides, threatening property, infrastructure and the "green ribbon" provided by road reserves and streamside areas. Climate change may lead to an increase in the proliferation of pest species, and subtropical pests may become established - requiring new approaches to pest management.

#### Response

Our response to the pressures presented by climate change is described in the Council's Climate Change

Action Plan (2013). The main linkages with this plan relate to the implementation of Water-Sensitive Urban Design into future urban development (including the use of more water permeable media for surface drainage), increasing the city's ability to sequester carbon by increasing vegetated areas and the importance of pest control in maintaining existing forest cover. With climate change in mind, we also need to ensure that the species we select for planting are continually revised, so we are confident in their ability to handle current and future changes in conditions. Dune restoration can also be used to protect our coastal environment from further damage, and ensuring healthy kelp and seaweed beds around the reefs will absorb energy from the waves.

### 11.1.3 Guidelines

#### Environmental pests

- 1 Preventing new species of pest plants and animals from establishing is more effective than eradicating or controlling them.
- 2 If total exclusion or eradication is not practical or economic, eradication in discrete areas, combined with containment in specific areas and preventing future spread is the next priority.
- 3 Where pests are established and widespread, and eradication is impractical or uneconomic, the focus will be on controlling them to minimise their adverse impacts on areas with the highest biodiversity values.
- 4 A precautionary principle will be used when we believe a pest species poses a serious threat to priority ecosystems or species. A lack of detailed knowledge or understanding of a pest plant or animal's full potential for damage is not a reason to do nothing.
- 5 All pest management must be environmentally, socially, culturally sustainable and financially prudent. Consideration must also be given to the impact of pest control on the environment and the management required. Control of pests should not create opportunities for further and possibly worse pests.

<sup>18</sup> Ministry for the Environment (2008). *Climate Change Effects and Impacts Assessment: A Guidance Manual for Local Government in New Zealand*. 2nd Edition. Mullan B; Wratt D; Dean S; Hollis M; Allan S; Williams T, Kenny G and MfE. Ministry for the Environment, Wellington.

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- 6 All animal pest control will be carried out in accordance with the Animal Welfare Act 1999 to ensure it is carried out humanely.
  - 7 Any traps used by the Council, agents of the Council or groups supported by the Council must meet the requirements of approved best practice. If traps are used in urban reserves or near to residential properties they must be safe for non-target species.
  - 8 Regular, ongoing baiting will be undertaken to ensure that pest populations remain at low levels and less toxin is required.
  - 9 New technologies will be trialled and evaluated as part of the animal predator control network.
  - 10 Qualified hunters will be employed to carry out any hunting operations on Council land and adequate notification of hunting operations will be given to ensure health and safety requirements are met.
  - 11 Fencing effort will be prioritised along the Outer Green Belt where grazing areas are adjacent to ecologically significant areas such as Otari-Wilton's Bush, Khandallah Park and Redwood Bush.
  - 12 All agrichemicals and vertebrate toxic agents will be used safely within guidelines by suitably qualified staff, contractors and volunteers where appropriate.
  - 13 While recognising the necessity of toxin and chemical use, alternatives such as biocontrol, new technologies, and bait station placement will be considered to gradually reduce the amount of toxins and chemicals entering the environment.
  - 14 Chemical and toxin free approaches will be promoted where practicable, such as in small urban backyards.
  - 15 Native vegetation should not be accidentally damaged during the use of agrichemicals, and where possible we will reduce our reliance on these chemicals by exploring new techniques.
  - 16 Biological control will be used where practicable for species that are widespread and in high densities, current examples being Darwin's barberry, tradescantia and gorse.

#### **Habitat loss and fragmentation**

- 17 Soil disturbance within ecologically significant sites should be minimised. Ground disturbance, within these sites will undergo evaluation as to whether it should proceed.
- 18 The Council Parks, Sport & Recreation team will advocate for the protection of natural areas across the Council's business groups, and provide information and advice on the ecological impacts of proposed activities and advice and examples of good practice to reduce or mitigate any impacts.

#### **Aquatic ecosystems**

- 19 There should be no further loss of natural streams within Wellington City
- 20 The impact of land based activities on our freshwater and marine ecosystems will be recognised and addressed through all Council projects
- 21 All Council projects should follow the principles of Water Sensitive Urban Design

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**In addition to protecting indigenous biodiversity, its restoration is also essential for Wellington to become a truly Natural Capital.**

## 11.2 Restore

### 11.2.1 Introduction

In addition to protecting indigenous biodiversity, its restoration is also essential for Wellington to become a truly Natural Capital. Much of the Council's restoration work is based around the restoration planting programme to increase the area of indigenous vegetation cover in the city, based on the assumption that if the habitat needs of species are met, species diversity will increase and ecological functions will be enhanced.

Our key focus areas to restore our indigenous biodiversity are:

**Ecologically significant sites** that closely resemble Wellington's original natural environment. We value these systems because they are rare and irreplaceable.

**Ecological functions** that are provided by species diversity or habitat structure to support a broad array of species.

**Remaining natural open spaces** that form an important part of wider ecological networks through supporting biodiversity and/or providing future restoration sites. These areas may not be considered of high ecological significance in isolation, but form the backbone of our green spaces and are a crucial feature in the restoration of our city.

**Nationally, regionally and locally significant species** that are rare or threatened in New Zealand or the Wellington region, uncommon in Wellington City, have cultural importance, or their loss would threaten the functioning of remaining indigenous ecosystems.

We are aiming to achieve self-sustaining ecosystems that can maintain their structure, species composition and function with ever decreasing input from Council. We also want these to be resilient ecosystems that can deal with (and recover from) the disturbance from outside urban influences, while retaining the same essential structure and functions.



**Above:** Council staff from a range of different teams plant 45,000 natives every winter as part of our restoration programme.

### Restoration planting programme

The Council's Berhampore Nursery grows around 100,000 native plants every year, of which 45,000 are planted and maintained by the Council for habitat and species restoration. An additional 35,000 are distributed among community groups and residents for the same purpose. The nursery grows up to 100 species, from hardy pioneer species to emergent tree species. The plants are all grown from eco-sourced seeds, collected by Council staff. Many community nurseries are also involved in growing plants for restoration programmes across the city, including Forest & Bird - Wellington Branch.

We use plants that would have originally occurred in the ecosystem as they are adapted for that area. This keeps the distinctiveness of Wellington's local flora, avoids the risk of planting species that could become invasive and, as local plants are better suited to Wellington's conditions, they are quicker to establish and more likely to survive. We also want to recreate habitat for Wellington's indigenous fauna and the best way of doing this is to look at what grew here originally. Ecosourcing means a much higher commitment in terms of seed collection but is the best way to protect and restore our indigenous biodiversity. Ecosourcing guidelines can be found on the Wellington City Council website.

#### 11.2.2 Priority areas for restoration planting

##### Restoring the integrity of areas

To restore the ecological integrity of core areas of indigenous forests and shrubland, we need to ensure that there are no gaps in the vegetation cover, thereby reducing potential for weed invasion and establishment. Where areas of habitat can be increased and made denser, the adverse impacts facing forest remnants will be somewhat reduced. Large intact areas are also much easier to efficiently manage than small fragmented areas, and more likely to be resilient and self-sustaining.

Increasing the size and complexity of habitat increases available resources and creates more ecosystem niches, supporting a greater diversity of species and

larger populations - making them more sustainable. Larger, intact forest areas have higher quality interior habitat. Planting buffer zones around the outside of these areas not only increases the size but reduces the edge effects.

Weed control, construction work, slips and trail building create canopy gaps, disturb the soil and release buried weed seeds. For this reason the restoration planting programme is tied in very tightly with our environmental weed control and trail programme. Canopy gaps can also be caused by natural processes such as tree fall.

Ensuring the integrity of our few remaining sand dunes is also very important. Not only are dunes a threatened ecosystem within Wellington, healthy functioning dunes provide a defence for the city in the event of large storms. Our native sand-binders (spinifex and pingao) produce dunes with a low regular profile, which are more stable. Vegetation won't stop the erosion of the dune, but native sand-binding species are critical for its recovery after a storm event. This was proven in the storm of June 2013 where the dune at Island Bay protected the infrastructure behind it, and is already on its way to recovery. The seawall, however, had no dune in front of it due to the restricted size of the beach and was severely damaged by the force of the waves.

##### Restoring missing species

Despite historical clearance of native forest, some areas of Wellington have experienced natural regeneration comprising a mixture of exotic and native species. In most of these sites the usual successional sequence has been altered owing to the presence of exotic species such as gorse and Darwin's barberry. Areas where natives are regenerating through gorse tend to lack the species richness of natural succession as would occur through kanuka, leading to a different final forest composition<sup>19</sup>. Within many areas of regenerating forest as well as

<sup>19</sup> Sullivan, J. J., Williams, P. A., & Timmins, S. M. (2007). Secondary forest succession differs through naturalised gorse and native kanuka near Wellington and Nelson. *New Zealand Journal of Ecology*, 31(1), 22-38.

restored planting areas, there is now single tier forest with little structural complexity, and there is little evidence of missing species returning to these areas naturally.

Owing to the lack of seed sources and natural dispersal mechanisms for the more common canopy and emergent species, areas where natives have naturally regenerated through gorse tend to be mahoe-dominant. To restore Wellington's native forest to anything like its original state will require enrichment planting in certain areas to increase species diversity and restore functioning ecosystems.

Even in many of Wellington's more mature forest remnants there is a lack of some of the species that are considered to be indicators of primary forest, including large podocarps. As well as the podocarps and missing tree species, a range of plant types are required to increase the complexity of a functioning ecosystem. In many areas the forest floor, understorey, subcanopy and emergent layer are missing. Plant types within these layers need to include not just trees and shrubs but grasses, ferns, fungi, climbers and epiphytes to ensure that each tier of the ecosystem holds a full range of representative species.

Threatened plant conservation will also entail restoring these species to their original habitats. This involves the need for careful sourcing of seed, propagating, planting in appropriate locations and monitoring to observe survival. Species which would be restored under this approach include *Muehlenbeckia astonii*, *Muehlenbeckia ephedroides*, *Pimelia aridula* and *Euphorbia glauca*.

Another challenge faced in Wellington is the gradual transition of the conifer forest (pines and macrocarpas) across the city (primarily within the Wellington Town Belt) back into native forest. By 2065 we are aiming to have 65 percent of the Wellington Town Belt in indigenous forest. This needs to be a gradual transition from one vegetation type to the other. Underplanting can accelerate the successional development under these degraded exotic conifer forests<sup>20</sup>.

#### Restoring connectivity

At present, many areas of remnant habitat are not large enough to ensure long-term survival of

<sup>20</sup> Forbes, S., Norton, D., Carswell, F. *Underplanting degraded exotic Pinus with indigenous conifers assists forest restoration*. Ecological Management & Restoration. 2014 Ecological Society of Australia and Wiley Publishing Asia Pty Ltd.



**Above:** *Pittosporum cornifolium* is an uncommon epiphytic species. Different planting techniques are currently being trialled so we can restore it to Wellington's forest.

populations of different species in isolation. In the urban area, it is often difficult if not impossible to extend the size of these core areas through buffer planting. To allow populations to expand and survive localised extinctions or reductions in populations, strategically located clusters of vegetation that provide core habitat for indigenous invertebrates, birds and lizards need to be connected. There is the potential to create a greater area of habitat by linking together these remnants. Creating connectivity across the landscape for fauna also enables them to cross-pollinate plants and disperse seeds.

Creating connectivity between our fragmented areas of habitat facilitates wildlife movement and connects significant areas of vegetation. Ensuring connectivity across the reserve network increases the resilience of populations, as they can be mobile in the face of events such as fluctuating food supply, increasing population and human-induced habitat changes. Without linkages between natural areas, individuals and populations can become isolated, which reduces their food supply and restricts their breeding ability. Animals often rely upon vegetated areas for movement because they cannot move through more inhospitable urban environments.

The aim for restoring our ecological connectivity is not to create continuous vegetated corridors but rather focus on existing natural areas and restoration projects that can contribute to a patchwork of habitats and refuges across the landscape. Such existing areas include parks, road reserves, horticultural and amenity areas, streambanks, coastal fringes, open space and backyards. These areas can be valuable for their undeveloped character and ability to provide connectivity through the surrounding landscape. Wellington is fortunate in its level of native regeneration, so some of these areas can restore themselves to a certain extent with minimal human intervention.

In the urban environment we tend to plant forest patches as “stepping stones” as opposed to a continuous forest tract (corridor). This is a practical solution where city infrastructure is also a priority. Stepping stones through the city facilitate movement

of mobile species, for example allowing them to rest and feed while moving between core areas. Tall stature vegetation in the right location can be used to fill this function. Appropriate use of species within urban design is a key part of creating this connectivity through the urban and suburban landscape.

To understand the functional connectivity of habitats, we need to consider the behaviour of the species, the distance it can move and its ability to be supported by the habitats through which it must move. Some target species may use corridors only a few trees wide, utilise stepping stones or may fly over open ground to reach quality remnants/patches. And others require corridors tens of metres wide. There will always be species that have trouble passing barriers. For some lizards, ground-dwelling invertebrates and even sedentary, understorey-inhabiting birds, we need to ensure that the areas these species are currently living in are of a quality that can sustain the population.

Wellington City also has several significant regional ecological linkages that need to be considered. The two main cross-boundary terrestrial linkages within Wellington are links into Belmont Regional Park and into Porirua Scenic Reserve. There is also a significant link for highly mobile bird species across Wellington Harbour to Matiu-Somes Island and Eastbourne. The principal cross-boundary freshwater link is within the Porirua catchment.

### **11.2.3 Beyond planting**

#### **Habitat restoration**

As well as planting, there are other requirements for restoring habitat for key species that can't be met in the short term by planting.

Within vegetated ecosystems, the role of logs and leaf litter cannot be underestimated. Leaf litter provides food and shelter for invertebrates. As well as playing an important role as decomposers, invertebrates are essential components of the food web for lizards and insectivorous birds. Rotting logs are good habitat for wētā, lizards and food for other invertebrates. In many areas that are naturally regenerating or being planted, there isn't much natural material to be found on the forest floor.

In an urbanised environment, we have changed things so much that “unnatural” aspects (such as built structures) and introduced species might be forming an important part of the habitat. Within many of the reserves, exotic species are currently filling the role that natives would have originally played. Substituting planting for mature stands of vegetation reduces the functionality of the vegetation as it takes many years to create mature vegetation as habitat for species. This must be considered before any removal of vegetation, whether native or exotic. This is particularly the case when it comes to emergent tree species such as solitary macrocarpas and pines within established native forest canopy. While the intention within ecologically significant areas is gradual replacement to indigenous species, this is a lengthy process and in the meantime these large trees fill an important function in terms of creating habitat. They can also provide a food source, as is the case with kaka feeding on the sap of pine trees. Another role that these large older trees play is providing the right niche for cavity nesting species, which includes kaka, kakariki, and saddleback.

Habitat can also be created through good urban design, aside from planting. If rock walls are designed

with gaps and spaces, not only can plants find a home, but they can also provide a great place for lizards. In addition, habitat restoration does not have to be limited to a terrestrial environment. In Wellington advances have been made in the restoration of marine plant communities and further experimentation in this area is required.

Also to consider is that human intervention has occasionally created areas suited to certain indigenous species. For example, grazing creates grasslands perfectly suited to native skink species. Case by case decisions will be made whether intervention will continue for the sake of the species, or if local extinction of species as natural processes continue and habitats change is an acceptable part of the restoration process. This will depend on the threat status of the species and whether the intervention is acceptable as part of ongoing management.

#### **Restoring our waterways**

Wetlands and streams are a priority for restoration as we have lost 99 percent of the wetlands in Wellington and most of our original streams are piped. Planting streamside (riparian) zones around streams is also important for water quality as it slows runoff and



**Above:** There are many habitat interventions that can create safe spaces for lizards such as the Ngahere gecko, seen here at a house in Karori. These include shelters, rock piles and rock walls. Photo: Michael Hamilton

filters sediment before it reaches the stream. Sites for riparian restoration are prioritised around sediment source significance and the impact on the stream and harbour depositional environments.

Actions that can minimise excessive stream sedimentation include the establishment of a sufficient riparian zone and bank stabilisation (ideally using soft engineering solutions). A sufficient riparian zone is commonly considered to be at least 10 metres wide (with a width of 15–20 metres being preferable) and consist of native woody vegetation. Within a heavily urbanised context a 5m setback might be considered adequate, whereas in a rural context at least 10m would be appropriate. Both overstorey and understorey vegetation are needed for a fully functioning riparian zone. A healthy riparian zone is important for reducing sedimentation, as well as restoring safe habitat for instream fauna. Vegetation shades the stream (native fish prefer cool temperatures) and overhanging vegetation allows detritus and insects to fall into the stream, providing a food source.

Another key to creating functioning freshwater ecosystems is to allow fish to travel throughout our catchments. Fish passage within Wellington catchments is limited by large drops, high water velocities, perched structures, low water depths and the presence of physical barriers, including weirs, culverts and fords, which block waterways. A priority will be to restore fish passage throughout the catchments that are still largely in a natural state. These will be assessed by monitoring the species above and below the barrier, identifying how much additional habitat will be opened up by the removal of the barrier, ensuring the barrier removal will not allow access to undesirable species (such as trout) and the feasibility and cost of barrier removal. Options are complete removal of barrier, creation of structures that allow fish passage, retrofitting existing structures such as culverts, and identifying areas of concern that could be addressed as upgrades occur.

Waterways can also be restored through the recreation of stream habitat, and we will aim to daylight streams where this is practical. We will be ready to make the most of opportunities to daylight streams where these arise through proposed infrastructure projects. Streams need to have sufficient room around them for their natural processes to occur, which in most cases means allowing riparian areas that may erode as the stream channel migrates. When infrastructure is proposed near streams, we will ensure that riparian areas are of sufficient width to allow for this channel migration and appropriate riparian planting. For this reason, we will promote the daylighting of streams within reserves where there is enough room for these natural processes.

#### **11.2.4 Guidelines**

##### **Restoring integrity**

- 1 Restoring the integrity and habitat complexity of our ecologically significant areas is a priority.
- 2 Our ecologically significant core areas will be buffered through planting where possible to increase their integrity.
- 3 Our ecologically significant areas will be linked together through corridors and stepping stones to allow species to move between them.
- 4 Threatened plant species will be restored to areas they are known to have existed.
- 5 Eco-sourced species will be used for all restoration planting.
- 6 Canopy gaps created as a result of weed control or construction work (including trail building) will be a high priority for restoration planting. Sites will be replanted as soon as possible, to reduce opportunities for new pest plants to become established.
- 7 Canopy gaps created through tree fall will be monitored and will be planted if there is insufficient native seed source, a weed seed bank in the soil, or if it offers an opportunity to enrich species diversity through the planting of emergent tree species.

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- 8 Weedy sites around the edge of forest remnants will be planted as part of restoring the buffer zones.
  - 9 Weed control on sand dunes will be immediately followed by planting to ensure that sand is not mobilised. Fertiliser will be used where we need to encourage existing sand-binders to cover bare sand.
  - 10 Maintenance after planting will prioritise controlling weed species that inhibit survival rates

#### Missing species

- 11 Large-scale targeted “enrichment” plantings will occur across the city to reintroduce missing species and create a seed source for the city.
- 12 Within the few forest remnants where the canopy is intact and there are indigenous plants in every tier, no further planting is required. This only applies in a handful of sites in Wellington, including the core area of Otari-Wilton’s Bush and Huntleigh Park. Within these sites, enhancement planting will only occur if monitoring shows little evidence of natural recovery.

#### Connectivity

- 13 When planting for connectivity through the landscape for flora and fauna, we will work towards the following recommendations<sup>21</sup>:
  - >5-hectare patches at about 5-kilometre spacings
  - >1-hectare patches at about 1-kilometre spacings
  - 0.02-hectare groves at about 200-metre spacings
- 14 When planting street trees, we will consider their role in connectivity and whether they can be a visual attractant to move indigenous birds along a desired route
- 15 When we aim to re-establish connectivity for any species we will consider the following movements: daily foraging, dispersal to find new territory, seasonal movements following food sources, and long distance migration.
- 16 For larger highly mobile bird species (such as tui, kereru and kaka), connectivity will be focussed

on ensuring large trees and groups of trees are available in strategic locations.

- 17 For shy and forest-dependent birds that are unable to move across large expanses of highly modified landscape, we will look at opportunities to create continuous canopy and/or a dense understorey.
- 18 The role of all open space will be recognised in order to allow plant species to naturally disperse through a fragmented landscape, particularly when those species are wind or water dispersed.
- 19 The needs of target species will be prioritised when linking together core areas and restoring connectivity through private gardens and vegetated road reserve.

#### Habitat restoration

- 20 Where branches or trees are removed, these will be left on site if they don’t pose a weed risk, fire risk, don’t threaten the existing vegetation and don’t compromise amenity values. Leaves and other debris will be kept on site when carrying out tasks such as trail clearance, rather than removing them.
- 21 In areas where there are cavity nesting species and no natural cavities to be found, nest boxes should be installed to meet this need in the interim. The use of nest boxes for other bird species such as little blue penguins will also be supported. Nest boxes will only be installed in areas where predator numbers are actively managed, or predator-proof nest boxes will be used.

#### Restoring our Waterways

- 22 The role of natural stream sections will be recognised as important habitat connections.
- 23 Daylighting streams in reserve areas will be prioritised, along with maximising opportunities through planned infrastructure projects.
- 24 Riparian planting will form no less than 20 percent of total Council planting per annum and focus on areas requiring shading or stream bank stabilisation.
- 25 Marine restoration projects will be supported when these are undertaken by our partners.

<sup>21</sup> Maria Ignatieva, M., Meurk, C., van Roon, M., Simcock, R., Stewart, G. *Urban Greening Manual: How to put Nature Into our Neighbourhoods*. Manaaki Whenua Press, 2008.

“After spending decades struggling to fence off nature from people, conservation is emerging on the global stage with a new vision that emphasizes the importance of connecting nature and people.”<sup>22</sup>

<sup>22</sup> Daily, Gretchen C., Kareiva, Peter M., Polasky, Stephen., Ricketts, Taylor H., Tallis, Heather.  
*Natural Capital: Theory and Practice of Mapping Ecosystem Services*. Oxford University Press, 2011.

## 11.3 Connect

### 11.3.1 Introduction

We are seeking to make biodiversity a mainstream topic by raising awareness of its value to people’s wellbeing, and the steps they can take to conserve it and use it sustainably. By connecting more people to nature we want to increase the role of the community as kaitiaki of the natural environment.

Today, 85 percent of New Zealanders live in cities and, accordingly, ecological consciousness is most relevant to urban populations. The greening of urban areas is increasingly important in providing a nature experience. If people are connected to nature, value it and understand its importance in underpinning their lives this should lead to a better quality of life. Wellington already has very active community

involvement in the environment, but this can always be increased, for the sake of the environment and the people themselves.

The Council acts as a steward of urban green space, and needs to balance conservation and recreational objectives. Getting this balance right can engage park users in recreational experiences, such as mountain biking, that also helps them appreciate the need for nature conservation.

People can take action in a number of ways, all of which are needed. Actions include everything from submitting on Council policies and plan changes and making personal “pro-nature” choices to engaging with others to take action directly to protect and restore natural areas.

Biophilic cities are cities of abundant nature in close proximity to city dwellers. They are biodiverse cities that value, protect and actively restore this biodiversity. Biophilic cities are green and growing cities where residents feel a deep affinity with the unique flora and fauna found there as well as with the climate, topography and other qualities of place that serve to define their urban home. In biophilic cities, citizens can easily recognise common native species (and in turn care deeply about them). Biophilic cities provide abundant opportunities to be outside and to enjoy nature through active recreation. Biophilic cities encourage us to spend more time amongst nature - increasing our personal wellbeing and resilience.

Biophilic cities place importance on education about nature and biodiversity and on providing many and varied opportunities to learn about and directly experience nature. In biophilic cities there are many opportunities to join with others in learning about, enjoying, deeply connecting with, and helping to steward nature - whether through a nature club, organised walks or volunteering for nature restoration projects. Biophilic cities invest in the social and physical infrastructure that helps to bring residents in closer connection and understanding of nature, whether through natural history museums, wildlife centres, school-based nature initiatives, or parks and recreation programmes and projects. Biophilic cities are globally responsible cities that recognise the importance of actions to limit the impact of resource use on nature and biodiversity beyond their urban borders; biophilic cities take steps to actively support the conservation of global nature.

### 11.3.2 Awareness and understanding

Our vision for Wellington is that indigenous biodiversity is a part of people's everyday lives - they will encounter native plants in urban landscaping and streetscapes, they will experience the thrill of being "buzzed" by kaka on their way to work, they will see eagle rays and New Zealand fur seals on Wellington's waterfront. Encountering native species is important in raising awareness of what is native and telling stories about what has been lost and what can be restored. If people experience indigenous biodiversity first-hand they will value it more and be prepared to take action to protect and restore it. Indigenous biodiversity also contributes towards strengthening local and national identity by celebrating what is special and unique about New Zealand. The term locally significant species is used in this context as it refers to species that aren't officially listed as threatened but have cultural significance to Wellingtonians and can be used to connect them with all biodiversity.

The Council understands the value of nature to our city and one of our goals is to ensure this understanding is shared by all Wellingtonians so that they understand the importance of nature on their lives, their impact on it, and what they can do to reduce the impact. Wellington has joined a network of

cities - the Biophilic Cities Project - that is seeking to increase the connection between people and nature.

The work we are doing means that more people will experience indigenous biodiversity as part of their everyday lives. They will see increasing numbers of native birds as witnessed by the proliferation of tui as a result of Council predator control, and kaka as a result of reintroductions by Zealandia and subsequent dispersal across the city. People already experience marine biodiversity during their interaction with the waterfront through chance encounters with New Zealand fur seals, common sightings of short-tailed and eagle rays in Frank Kitts lagoon during summer, sharing Oriental Beach with variable oyster catchers, and the occasional sighting of orca, dolphins or little blue penguins in the harbour or on the south coast. Other encounters may be more common but less appreciated - such as encounters with red-billed and black-backed gulls.

People can also experience native species through amenity planting. Road reserves and street trees provide an important visual link to nature in an otherwise urban landscape. At present, many of these comprise exotic species as well as natives.

City centres are generally areas where there are limited connections to the natural world.



**Above:** The Wellington waterfront and Frank Kitts lagoon are visited by huge numbers of residents and visitors every day. Encouraging native biodiversity into these areas allows a wider range of people to establish a connection to nature.

However, connections can be made through references to nature as well as nature itself. References to native species and cultural forms (eg pou whenua, waharoa) in urban design and landscape architecture are an important tool in “place making” and making a city more “biophilic” - celebrating the unique natural character of a city, placing it biogeographically whilst making it a more attractive and exciting place to live and work. This can be seen through some iconic Wellington design which references nature, such as Ian Athfield’s nikau columns around the central library and the fern ball in Civic Square.

Through existing and future plans there are a number of exciting opportunities to include indigenous biodiversity in the city’s urban public spaces - making our streets green and creating an eco-inner-city. These will also shape the city in response to its local setting and create inner-city neighbourhoods that tell our stories<sup>23</sup>.

As a city set in nature, we have many opportunities to do this<sup>24</sup>. We have emphasised the importance of better green infrastructure such as open spaces,

<sup>23</sup> WCC Central City Framework

<sup>24</sup> Wellington Urban Growth Plan

trees and waterways. These plans also identify the importance of the coastal environment, including ensuring that coastal development and activities respect and enhance the landscape, ecological and character values of the harbour and rugged coastal areas. This offers further opportunities to reconnect people with our coastal fringe and ensure they have easy access to a healthy coastal environment.

We can also make people aware of nature through recreational activities. Mountain biking and dog walking both cause people to spend time outdoors and we can build on these activities to link them more strongly with our biodiversity outcomes. In Wellington, we also have a strong trail building community who create linkages into our natural areas. We acknowledge the importance of allowing people to access these areas, while needing to protect our ecologically significant areas from further fragmentation. We will work to resolve the tension between these two activities and find a balance that allows for both.

### 11.3.3 Biodiversity and human wellbeing

In order to create support for the Council to protect and restore biodiversity or take action themselves, people need to understand the importance of biodiversity and natural processes through the life-



**Above:** Not all experiences have to be with living things. References to native species can also encourage a relationship with the natural world.

supporting “ecosystem services” that underpin their lives. The World Health Organization now recognises the interdependence of human health and ecosystem health<sup>25</sup>. The positive, innate bond between human wellbeing and nature is supported by environmental health science<sup>26</sup>.

People also need to understand what is “indigenous” and why New Zealand’s biodiversity is unique and special, as well as how healthy biodiversity can influence their own health and wellbeing. The Council has a role in informing its citizens about biodiversity. To do this effectively, we also need to work in partnership with other agencies, including DOC, GWRC, NGOs and partners such as Wellington Zoo and Zealandia.

In addition to educating people about the values of our native biodiversity we need to raise awareness around threats to it and the actions we can take to help protect it.

Children must spend more time outdoors - for their good health and the health of our planet. A growing body of research is showing that it is important for children to connect with nature and the outdoors for their health, ability to learn, self-esteem and character development. Childhood engagement with nature is the key to building on this relationship for generations to come. This can include everything from natural unstructured play and edible gardening to involvement in local restoration projects.

The Council understands the importance of connecting future generations with nature, and continues to support a number of education programmes to increase environmental literacy amongst school children and young people. This includes making them aware of where food, fibre, medicine and construction materials come from. We are also developing a number of new initiatives that will help bring young people into closer contact

with nature, linked to learning outcomes. We currently support a number of initiatives working with schools to increase children’s environmental awareness, including the proposed Children’s Garden at Wellington Botanic Garden.

#### **11.3.4 Taking action**

Conserving our indigenous biodiversity is not the Council’s job alone and it requires all sections of society to become involved at some level, taking “pro-nature” action in their daily lives. This applies whether they live in a central city apartment, out in the suburbs or on a rural lifestyle block. One role of the Council is to motivate and inspire communities to get more involved - to change behaviour and enable people to take action themselves. If we do this well people will understand why it’s important to protect New Zealand flora and fauna, how their actions and choices impact biodiversity, and what they can do to help protect the natural environment.

Once people care for and value nature, including indigenous biodiversity, they are more likely to become engaged citizens taking action to protect what they value by participating in democratic processes. This includes taking the time to submit on notified resource consents, District Plan changes, and Long-term and Annual Plans. The Council involves the community in environmental decision-making through its Environmental Reference Group - an advisory group made up of non-elected members selected for their expertise or ability to represent a specific interest group.

Initiatives to support behaviour change should lead to people making “pro-nature” choices that impact positively on local and global ecosystems. This might include exercising responsible pet ownership, desisting from dumping green waste in reserves, and preventing pollution (such as car oil, paint and cement) from entering drains. Edible planting in people’s backyards and public areas also plays an important role in connecting people to the natural environment. We can also promote broader behaviour change to help reduce impacts on global ecosystems and biodiversity - for example, by influencing

<sup>25</sup> Zinsstag J, Schelling E, Waltner-Toews D, Tanner M (2011) From “One Medicine to One Health” and systemic approaches to health and well-being. *Prev Vet Med* 101: 148-156

<sup>26</sup> Keniger LE, Gaston KJ, Irvine KN, Fuller RA (2013) What are the Benefits of Interacting with Nature? *Int J Environ Res Public Health* 10: 913-935.

consumer choices towards buying sustainable timber, and climate change related actions, such as reducing emissions from transport, and energy conservation.

We can also encourage and enable people to take action in their own backyard to protect biodiversity. The community needs to understand the impact of their actions (both positive and negative) on indigenous ecosystems and the measures needed to protect and restore them. Private backyards play a key role in achieving positive biodiversity outcomes. This can range from removing weeds and planting native plants to providing food and habitat for birds, lizards and invertebrates to trapping or baiting to reduce predator numbers. It can involve actions such as composting, growing their own food and not using pesticides in the garden. All these actions are useful as participation can reconnect people to nature and can lead to increases in other environmentally responsible behaviours<sup>27</sup>. We cannot overstate the importance of private backyards in the bigger picture of Wellington's biodiversity.

### 11.3.5 Partnerships

Communities and iwi feel a deep sense of stewardship/kaitiakitanga towards their green spaces and natural places, and agencies such as DOC and GWRC have their own mandate-driven reasons. We believe that our goals will only be achieved by working towards a shared vision and in partnership with these allies. We will use our influence and local leadership to agree this common vision and coordinate the effort in our area. Our main partners fall into three categories and these require slightly different partnership strategies.

- Statutory agencies and national Non-Governmental Organisations (NGOs) with an interest in biodiversity. These include DOC, GWRC, neighbouring local authorities, Porirua and Hutt City Councils, Queen Elizabeth II National Trust (QEII), The National Office of the Royal Forest & Bird Preservation Society (F&B), Te Papa, WWF-New Zealand, Zealandia and Wellington Zoo;

- Iwi and mana whenua. The Council has a partnership with these groups under the Treaty of Waitangi. In Wellington the bodies that represent mana whenua interests are the Port Nicholson Block Settlement Trust, Te Runanga o Toa Rangatira and the wider Māori community;
- Local community-based conservation and restoration groups. This includes the Wellington Branch of Forest & Bird, Wellington Botanical Society, Friends of Taputeranga Marine Reserve and many others ranging in size and formality.

We will work with the primary biodiversity management agencies (DOC and GWRC), mana whenua, NGOs and communities to develop a shared direction. This agreed direction will allow all organisations and groups to work to their strengths in a complementary way, creating the best outcome for biodiversity.

#### Community restoration groups

The community has an important role to play in the protection and restoration of Wellington's biodiversity and open spaces. Community support has grown considerably over the last 10 years, from 12 groups in 2002 to 114 in 2014. This is incredibly positive and demonstrates the high levels of passion and interest Wellingtonians have for their open spaces.

These groups are all involved in environmental protection, restoration, education and/or advocacy ranging from occasional restoration planting (with the support of native eco-sourced plants from the Council's Berhampore Nursery) to active biodiversity management. We also support groups which have a primary focus on other activities such as edible gardening or trail building, but play a part in furthering biodiversity. Groups range from two or three individuals working in a neighbourhood reserve to incorporated societies and trusts carrying out restoration and activities including pest animal and plant control and restoration planting over a number of years.

In recognition of the important role played by community groups, the Council supports these groups through a number of programmes. This

<sup>27</sup> Foddy, M., Smithson, M., Schneider, S., Hogg, M. A. Resolving Social Dilemmas: Dynamic, Structural and Intergroup Aspects. Psychology Press. 2014.

includes the Council supplying groups with an annual allocation of native plants grown at the Council's Berhampore Nursery, advice from Council technical staff, support from Park Rangers and training opportunities. Each group signs a Memorandum of Understanding with the Council to cover shared objectives, respective roles and responsibilities, the area they are working in and the activities they are carrying out. The Council will also work with each group, providing necessary plans and guidelines, to ensure they are following best practise with regards to restoration and pest control.

Wellington's community restoration groups are listed on the Council website or on [Naturespace.org](http://Naturespace.org), New Zealand's ecological restoration portal.

Community involvement in open space areas is an integral and valuable part of managing of the land. However, the establishment of community groups does not always reflect the priority of the area in terms of ecological values and biodiversity. The Council is committed to supporting such groups and

their projects regardless of site significance, as it is important that everyone has the ability to connect with a restoration project in their own way. We work with groups to integrate them within the overall management of open space areas, and ensure that the projects are sustainable. This may result in resources being applied to open space in recognition of the community interest ahead of biodiversity values, recognising the future potential of a site and the importance of engaging a large number of the community. The criteria by which community group support is assessed can be obtained on the Wellington City Council website.

The Council's Our Living City grant pool supports environmental projects, including ecological restoration, smart energy, community gardens and sustainable transport. The fund runs three rounds a year with an annual cap of \$80,000, and applications are assessed by a panel comprising Council officers and elected members. Advice on applications is sought from relevant Council business units.



**Above:** Growing vegetables, such as this selection from Innermost Gardens, is another way of connecting people with the natural world. Often this will lead to other pro-environmental behaviour and a broader interest in the outdoors.

### **Ecological leadership**

The Council will take a greater leadership role in determining ecological outcomes and restoration priorities for the city and will develop plant lists for specific zones or sites based on these priorities (based on the species that originally grew in these zones or sites). The plants we provide for restoration purposes in those zones will be based on those lists. The Council will also take a greater leadership role in working with and supporting community groups in terms of technical support and the provision of advice.

### **Pest animal and plant control**

There is a growing interest from community groups in carrying out animal pest control. This brings benefits both in terms of increasing community engagement and creating opportunities to increase the area of land under active integrated pest control. Groups need intensive support and training when they start (including capital investment in traps and equipment), and there are ongoing monitoring and compliance costs to ensure groups are maintaining necessary levels of control to achieve desired biodiversity outcomes. There are also numerous health and safety issues that need to be identified and managed. There may be opportunities to strengthen networks of community groups allowing them to support each other and share experience and best practice.

Groups are also increasingly struggling with pest plant control, particularly within planted restoration sites. The Council needs to provide further assistance to groups regarding pest plant control, both technical advice and physical work. Groups need to be encouraged to monitor their sites for plant survival to ensure they are being managed in the optimal way.

### **Groups working collaboratively**

In some areas there are a number of community groups working towards similar goals but not in a coordinated way. Resources can be allocated more efficiently and ecological outcomes achieved more effectively if groups working within a select geographic locality coordinate their activities.

One way this could be achieved is through catchment based umbrella groups. This would also help to facilitate the restoration of aquatic ecosystems, given their complicated nature. This approach has been successfully piloted in the Kaiwharawhara Stream catchment - with a forum being supported by the Council to improve coordination and communication between groups working there. The Council will promote greater sharing of resources, expertise and cooperation in catchments and may identify individuals or groups to take a lead role in a specific activity based on proven competence and approach. Groups working within a catchment will be supported to work together more closely and develop specific areas of expertise or combine their efforts by merging.

### **11.3.6 Guidelines**

- 1 Native biodiversity will become a common experience through reintegrating it into both the city's open space network and the built environment.
- 2 To motivate a mainstream audience to take action for biodiversity, programmes will be long term and involve a range of actions and a wide array of partners.
- 3 Open spaces need to be preserved for values other than biodiversity including sports, recreation and landscape values and we will ensure that all Wellingtonians have some access to these areas.
- 4 Environmental groups will be consulted early in the policy development process to help Council officers develop policies based on good practice.
- 5 Community groups will be our partners when delivering biodiversity outcomes, guided by current agreements and Council's guidelines for community group support.
- 6 Where there are multiple groups in a single geographic area, groups will be encouraged to work together and coordinate their efforts in order to deliver better outcomes; and allocation of resources will be dependent on this collaboration.

- 7 A number of partners, including biodiversity management agencies and NGOs, carry out biodiversity projects and we will work with them to avoid duplication and share resources.
- 8 Any programme of pest control on open space must be supported by a longer-term strategy of community education and awareness raising and be in partnership with other organisations.
- 9 Mana whenua will always have the opportunity to be involved as partners in biodiversity initiatives.
- 10 Other Māori groups not connected to mana whenua interests will also be involved in exercising kaitiakitanga.
- 11 Native plant species will be highlighted in amenity planting in public spaces.
- 12 Urban designers will use representations of native species in street furniture and civic architecture where this fits with the design aesthetic.
- 13 Edible planting will be used as a way to initially engage people with the natural environment.

## 11.4 Research

### 11.4.1 Introduction

The knowledge of how urbanisation impacts upon our natural environment (and, most importantly, how we can reduce those effects) is essential to ensuring our environment remains healthy for future generations. Research and sharing information is crucial when it comes to increasing our ability to manage Wellington's indigenous biodiversity in innovative ways.

One of the challenges that we face is that we do not fully understand the complex interactions between the urban environment and the species that live around us. Much of the research on our indigenous biodiversity has occurred in large-scale natural environments and we are aware that species can behave differently within the complex mix of land uses and habitats that occur within our city.

There are many unknowns about the most efficient and effective ways of restoring Wellington's natural



**Above:** Auditing the rubbish collected from Wellington beach clean-ups allows organisations such as Sustainable Coastlines to monitor long-term trends.

areas, including what may or may not be achievable. Focussed research, in parallel with the Council's monitoring programme, could help us to understand some of the ecological dynamics happening in and around our city, and where best to concentrate restoration efforts.

Because of the size and type of the land under its control, the Council has a valuable resource that can be made available for study by others or used by its own staff for research and investigation. As hands-on managers of open space, and an organisation that is connected to the wider community in numerous ways, the Council has the potential to research issues that are particularly significant locally, in the context of an urban environment.

However, research should not just be limited to Council managed open space. To understand the dynamics across an urban environment, research must be conducted across all land, regardless of use and ownership. The interactions of people - including recreational users, neighbouring property owners and restoration groups - with plants, animals, land and water are also an important and evolving part of the Wellington's ecology.

We need to develop new ways to make indigenous nature and biodiversity a part of Wellingtonians' daily lives. We can do this by increasing their knowledge and appreciation of urban nature. We must be able to fully understand our natural environment through research, and be able to explain it and present it in a way that makes sense to people. This will be strengthened if we can include people in the research through their personal observations and experience.

Innovative and specific research can be expensive and generally beyond the Council's resources. The Council can partner with research organisations to identify areas of study that have direct and practical application to open space management. Other agencies, such as Greater Wellington Regional Council (GWRC), the Department of Conservation (DOC), Landcare Research, and universities, also carry out or commission research that is relevant to the ecological management of the Council's open space.

#### **11.4.2 Levels of research**

When it comes to research and monitoring, our focus will be at three main levels. These three levels allow us to engage across the community and build the most complete picture of Wellington's ecological health. A consistent approach is needed so the data can be combined and compared across projects, and used to build understanding of Wellington's ecological integrity. Data analysis is essential, particularly when involving the community in data collection, to ensure that the research is meaningful.

##### **Broadscale research**

Using a crowdsourcing/citizen science method of data collection, you can source large amounts of data over a wide geographic area for little cost. This approach would be used to find broadscale information (widespread and simple) on things such as lizard distribution in Wellington, and anyone could get involved. Future areas involving citizen scientists include monitoring biodiversity in backyards, identifying predators from sensor camera images, and establishing the presence or absence of species across the city. Citizen science requires careful planning and management to ensure that the design allows for consistent methodologies for data collection and that relevant locations are well represented. This requires initial and ongoing collaboration between the Council, scientific organisations and the participants.

##### **Research of managed places and species**

This research focusses on delivering the detailed information needed to manage places and species effectively at an appropriate scale, so is more intensive than what can be achieved through broadscale projects. While the Council can undertake some research at this level, we can get a much clearer understanding by engaging our community in monitoring. This level of research includes looking at stream, forest and coastal health and recovery. This can help show what management works best, and can be used to improve the effectiveness of future management. It will also provide locally relevant information to share with the wider community.

### Targeted research

On occasion, we need to answer specific questions that require a more detailed level of research and analysis. We may conduct this research ourselves as a Council, or for this form of research, we may work in partnership with local research institutions and/or relevant organisations. This research includes questions around the effect of aspects of the urban environment on specific species, questions around preferred microclimates for threatened species, and questions around the impact of pest species.

#### 11.4.3 Monitoring

Without good information, it is difficult to evaluate the success and cost-effectiveness of the work being undertaken. Record keeping and monitoring has not always been undertaken consistently or systematically in the past, especially in relation to restoration plantings. Consequently, consistent information about plant survival rates, maintenance and the rate of canopy closure has not been available to inform future efforts.

By regularly sharing and reporting monitoring data and assessing its usefulness, the Council, researchers and community groups will be able to review and learn from successes and failures, adapt future on-the-ground work as required, and target future monitoring to ensure useful information is being gathered in relation to:

- the health of Wellington's ecosystems
- the results of pest control
- the results of specific restoration projects.

However, the cost implications of monitoring means that the choice of what is monitored and how needs to be carefully considered.

Until recently, monitoring has tended to focus on measuring aspects of operational performance (*output* monitoring), such as the amount of bait taken from bait stations. This remains an important part of monitoring; checking performance through regular audits of weed control and planting sites ensures targets are met, ensures sound financial management and use of resources.

What such figures do not tell us is how well our desired outcomes are being achieved. For example, a possum eradication programme may remove all possums, but if it allows rats to increase substantially, then the overall improvement in the environment may be far less than expected. So we need to ensure that our monitoring programmes are comprehensive, answer the essential questions and assist us in meeting our agreed outcomes.

We also need to ensure that monitoring aspects of Council business that impact on biodiversity is considered, such as the outcomes of resource consent decisions and evaluations of projects funded through Council grants.

Baseline monitoring was started in 2002 for the following indicators:

- the distribution and relative abundance of native forest bird species
- the structure and composition of forest and coastal plant communities
- the extent of vegetation types in natural areas managed by the Council
- the condition of forest vegetation sensitive to possum browse
- the condition of stream habitat in urban areas (using Stream Habitat Assessment Protocols).

By creating a strategic monitoring programme, then continually analysing the results, we will be able to continually adapt our biodiversity management and refine our techniques. This aim for continual improvement is an essential outcome of all monitoring programmes.

#### 11.4.4 Sharing information

With research on urban ecology (including pest control and species interactions) being given increasing priority by institutions, new information is regularly available. Some of the information is directly relevant to Wellington City and some of indirect relevance, establishing context, principles and theory. Keeping up to date on research will assist in ensuring planning and implementation is in accordance with

the latest information available. This information, as well as all information gathered by the Council, needs to be made widely available.

Reports and information gathered through monitoring and research need to be shared through public forums such as websites and newsletters.

Many different groups of people and organisations could also benefit from the availability of open biodiversity data, including the Council. For example, by having the data freely available, everyone can see the locations of ecologically significant sites and assist with their protection.

With a variety of organisations collecting and generating a wide variety of biodiversity data and information, sharing this data has many advantages:

- More citizens will engage with the Council to support biodiversity initiatives if they can access all data, it allows for transparency and empowerment;
- Advocacy groups and researchers can analyse the data potentially producing new and better insights into the issues; In scientific research, the rate of discovery is accelerated by better access to data.
- New and existing businesses (such as nature tourism) can use the data, combined with information from other sources, to produce new services and products such as smart phone applications;
- Existing biodiversity management could be significantly improved as operational data becomes available to others, allowing recommendations for improved efficiency and effectiveness.
- If we can also share biodiversity data with that from other organisations, combined data sources and patterns in large data volumes can lead to new knowledge
- Sharing data widely helps ensure that the knowledge is preserved over time.

#### 11.4.5 Key research questions

##### Protect

Managing plant and animal pests across a wide range of land types, such as large forested reserves, small suburban parks, thin corridors of vegetation and private backyards, creates a unique set of challenges and most ecological pest control research has been conducted in large forest tracts or an agricultural landscape.

In addition, because the mix of environments and pests is specific to Wellington, there is constant learning by those involved, leading to continual improvement of management strategies and control techniques. Encouragement of an open learning style leads to sharing of useful information in the field. There are new technologies for pest management that need to be scientifically trialled, as well as ongoing trials of biocontrol agents.

- How do pest species behave in urban environments?
- Which urban landscape is more likely to contain high levels of pest species?
- Does the urban landscape influence the population dynamics of pest species?
- Is pest abundance influenced by socio-economic variables?
- What is the impact of mammalian predators on our native species (including the impact of cats on lizards and which species of bird are particularly prone to predation by cats)?

To find solutions for minimising the impacts of stormwater runoff and land based effects on our aquatic ecosystems we need to better understand how the whole system operates.

We also need to better understand the utility and potential of small pockets of urban vegetation, such as road reserve, so we can better assess their value to the ecological network of Wellington and we need to understand the effects of urban intensification on the importance of these remaining small vegetated areas.

- How can urban design help minimise pest problems?
- Do we understand the effects of edge effect, habitat corridors, and fragmentation in urban environments?
- What effect does the modification of land and waterways have on aquatic ecosystems?
- How can we increase the uptake of Water Sensitive Urban Design and increase knowledge of the connection between stormwater and streams?
- What native plants will work best as green infrastructure in urban design? This includes green roofs, water-sensitive urban design, and street trees.
- What is the threshold of impervious surfaces against stream health?
- What impact do street lights in Wellington have on our indigenous biodiversity?

### Restore

Restoration has a number of effects on the environment that need to be further understood.

With the fragmentation of our forests and its gradual transition into a variety of states, we need to understand the processes that are occurring and where we need to intervene. It is important to have accurate knowledge of the requirements around enrichment planting and specific species' microhabitat needs, as well as propagation techniques - particularly of threatened species (national, regional and local).

Bird monitoring shows that kaka are spreading throughout the city and breeding throughout reserves. Other species known to have bred within the reserves network through monitoring programmes include kakariki, whitehead, saddleback and bellbird. Each of these species has a different set of characteristics that affects their vulnerability to urban predators. We don't yet know enough about the reasons why some species are managing to increase their numbers

and some are failing. There are a number of cavity nesting species in Wellington, such as kaka, kakariki, saddleback, morepork and kingfisher. We don't know if the significant reduction of old growth forest is limiting these species, or if there are enough natural cavities within the reserve network.

We also know very little about the ecology of other significant groups of plants and animals within Wellington City (namely lizards, bats, invertebrates, and fungi) which makes the restoration of species within these groups challenging.

- What are the microhabitat requirements for the missing plant species we aim to reintroduce?
- What is the survival rate of Council restoration plantings and how can this be improved?
- What are the habitat requirements (including for nesting) for fauna already present in the city?
- What is the relationship between soil ecology and plant establishment?
- What species are required to provide critical food resources for bird species?
- What natural succession is happening in urban forests?
- How does bird dispersal in Wellington affect the distribution of podocarp seeds?
- What are the limiting factors for a population's expansion, eg food or nesting sites, and what are their powers of dispersal?
- When is each species vulnerable, eg is it while they are nesting or feeding?
- Where are vulnerable or significant populations of our lesser known fauna, such as bats, invertebrates and fungi?
- Are browsing animals limiting natural regeneration in Wellington reserves?

### Connect

There is huge potential for social research, particularly the part that people play in urban

ecology. Opportunities for researching these topics may be realised as a result of the research partnership established between the Council and Victoria University of Wellington in 2013. We need to carry out social research to better understand why the community engages with environmental projects, or the barriers to getting involved.

- What are the motivators and barriers to people using the reserve network and people engaging in various environmental restoration projects?
- How do we combat “nature deficit disorder” in Wellington?
- What are the health and wellbeing benefits of urban nature?
- How do we use effective community-based social marketing techniques?
- How do we engage people in citizen science projects?
- What are the impacts (social and ecological) of supplementary feeding on urban bird populations?
- What are the economic impacts of urban biodiversity?
- What are economic impacts of volunteer environmental restoration projects?
- What ecosystem services do Wellington’s green spaces provide and what are the values of these?



**Above:** We don’t know much about Wellington’s invertebrates such as the peripatus. More research needs to be done on these species to establish where they are and what they need. Photo: Zealandia

#### 11.4.6 Guidelines

##### Research

- 1 Crowdsourcing and citizen science approaches will be used where the requirement is to collect large amounts of geographically based information.
- 2 Community groups will be engaged in monitoring specific sites and species, and given the support and training required.
- 3 Targeted research will be conducted in partnership with relevant organisations.
- 4 Where possible, university students will be engaged to conduct research on our behalf to support a new generation of scientists.

##### Monitoring

- 5 Monitoring programmes will be established or maintained to measure changes in the condition of priority sites and to determine the effectiveness of animal and plant management being undertaken.
- 6 Work done will be regularly audited to ensure it is being performed to the required standard and in accordance with all relevant policies and procedures.
- 7 Monitoring will be used to establish the effects of our urban environment on our aquatic ecosystems.
- 8 All monitoring will be consistent with a local, regional and national picture.
- 9 Monitoring data will be used to analyse trends and make recommendations for adaptive management.

##### Sharing information

- 10 All work will be informed by current best practice and this information will be made available to staff and contractors.
- 11 All information gathered by the Council as part of research and monitoring programmes, particularly programmes that have included the community gathering the data, will be shared with interest groups and the general public.
- 12 Relevant information gathered by the Council as part of research and monitoring programmes will inform Council plans and policies such as reserve management plans and the District Plan.

# Glossary

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**Benthic:** living on or under the substrate at the bottom of the ocean.

**Biodiversity (biological diversity):** all biological life, including fungi and micro-organisms, the genes they contain and the ecosystems of which they form a part. *The term biodiversity in this plan means indigenous biodiversity unless otherwise stated.*

**Biosecurity:** the protection of people and natural resources, including biodiversity, from unwanted organisms capable of causing harm.

**Buffer zones:** the zone around a core protected area that shields that area from possible disruptive external influences.

**Catchment:** a catchment is all the land from the mountains and hills to the sea, drained by a single stream and its tributaries.

**Community:** the collection of organisms found at a specific place and time.

**Competitor release:** the expansion of a species in the absence of a competitor.

**Convention on Biological Diversity:** an international agreement on biological diversity that came into force in December 1993. The objectives of the Convention are: the conservation of biological diversity; the sustainable use of its components; and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.

**Core areas:** interior areas of a patch that retain similar abiotic and biotic conditions to pre-fragmented conditions and do not experience strong influences from neighbouring patches.

**Corridor:** narrow strips of land that differ from the matrix on either side. Corridors may be isolated strips, but are usually attached to a patch of somewhat similar vegetation.

**Daylighting:** the redirection of a stream from a pipe into an above-ground channel to restore a stream of water to a more natural state.

**Diadromous:** diadromous fish migrate between freshwater and seawater.

**Eco-domain:** a domain representing a cluster of repeating biogeoclimatic patterns where within each domain there are a consistent, predictable response of ecosystems to impacts and changes.

**Ecology:** the study of the distribution and abundance of species and the relationship and interactions between the species and their environment.

**Ecological integrity:** an ecosystem is considered to be healthy and have “integrity” when it hosts all the native plants and animals typical of the area, and when ecological processes are functioning well.

**Ecological region:** an aggregate of adjacent ecological districts with very closely related characteristics.

**Ecological significance:** defined for an area by one or more of the following ecological features: representativeness of Wellington’s indigenous biodiversity, high diversity of ecological and physical features, degree of natural character, relative size and shape, relative rarity and special features, buffering, connectivity and viability. These ecological features contribute to Wellington’s indigenous biodiversity and include consideration of current and potential biodiversity values.

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**Ecological succession:** a fundamental concept in ecology that refers to more-or-less predictable and orderly changes in the composition or structure of an ecological community. Succession may be initiated either by formation of new, unoccupied habitat (eg a severe landslide) or by some form of disturbance (eg fire, severe windthrow, logging) of an existing community.

**Eco-sourcing:** the propagation of naturally occurring (ie not introduced accidentally or deliberately by humans) plants from local areas and the planting of them back within the same region.

**Ecosystem:** a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

**Edge effects:** the changes in population or community structures that occur at the boundary of two habitats.

**Emergent trees:** trees that are over 30 metres tall and tower above the forest canopy.

**Endemic:** an indigenous species that is restricted to a particular geographical region, ie it is found nowhere else in the world.

**Exotic species:** *see Introduced species.*

**Ex-situ conservation:** the conservation of species outside their natural habitat.

**Feral species:** a domesticated species that has become wild.

**Habitat:** the place or type of an area in which a living thing naturally occurs.

**Inanga:** the adult lifestage of the most abundant whitebait species, *Galaxias maculatus*.

**Indigenous:** a plant or animal species that occurs naturally in Wellington

**In-situ conservation:** the conservation of species (and the ecosystems and habitats that support them) within their natural surroundings.

**Introduced species:** a plant or animal species that has been brought to the locality by humans.

**Kaitiakitanga:** implies guardianship, stewardship, protection, care and vigilance. It introduces the idea of an inter-generational responsibility and an obligation to protect the natural environment.

**Key Native Ecosystem:** an area that is actively managed by GWRC to protect and enhance indigenous biodiversity values.

**Land environment:** an area whose boundaries encompass similar environmental characteristics caused by environmental variables such as climate, landform and soil

**Locally significant species:** a species that has no national or regional threat status, but is important in Wellington for its cultural values

**Meso-predator release:** a situation in which populations of small and medium-sized predators rapidly increase after the removal of larger predators.

**Native species:** *see Indigenous species.*

**Originally rare ecosystems:** an ecosystem type that was present, and rare, when Māori arrived - and still exists today.

**Outcome monitoring:** monitoring the desired outcome of biodiversity activities, eg an increase in native birds.

**Output monitoring:** monitoring the outputs from activities required to reaching your desired outcome, eg a reduction in pest animal numbers.

**Podocarps:** trees or shrubs that have linear-like leaves and are usually dioecious. Eg totara, rimu, kahikatea, miro and matai.

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**Representativeness:** the extent to which areas are capable of reflecting known biological diversity and ecological patterns and processes.

**Regeneration:** the natural process by which plants replace or re-establish themselves

**Resilience:** the capacity of a system to absorb disturbance while undergoing change so as to still retain essentially the same structure and functions

**Restoration:** intentional activity that initiates or accelerates the recovery of an ecosystem

**Revegetation:** the process of replanting and gaining vegetated cover on disturbed land

**Riparian:** the interface between land and a river or stream

**Stepping stones:** patches of discontinuous vegetation that can be used to link larger areas together.

**Sustainable:** conducting activities or using the components of biodiversity in a way and at a rate that does not lead to the long-term decline of biodiversity.

**Threatened species:** a species that is vulnerable, endangered or presumed extinct. Acutely and chronically threatened indigenous species are species that meet the specific criteria to be listed in one of these categories in the “New Zealand Threat Classification System Lists” (refer to [doc.govt.nz](http://doc.govt.nz) for up-to-date lists).

**Translocation:** a deliberate and mediated movement of wild individuals or populations from one area to another.

**Vascular plant:** a plant having specialized tissues (xylem and phloem) that conduct water and synthesized foods, as any fern, gymnosperm, or angiosperm

**Veteranisation:** destructive pruning methods, which accelerates the ageing process of trees.

**Weed:** any unwanted plant organism that outcompetes, displaces and/or prevents natural succession of indigenous species.

**Wellbeing:** the state of being comfortable, healthy, or happy; both mentally and physically.

## Appendix 1 – Policy context

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Wellington City Council has responsibilities under a range of different government acts, plans and policies.

### Acts

The Council carries out and encourages biodiversity management in accordance with the wishes of its community, as expressed through the Community Outcomes in the Long-term Plan prepared under the **Local Government Act 2002**.

The **Conservation Act 1987** (Department of Conservation) is New Zealand’s principal act concerning the conservation of indigenous biodiversity. The **Conservation Act** has the overriding principle of protection.

Under the **Conservation Act**, the Department of Conservation has responsibilities to prepare **Conservation Management Strategies** which cover the Wellington City area, particularly in relation to community advocacy and the protection of indigenous plants and animals.

The **Conservation Act** sits alongside the **Reserves Act 1977** (Department of Conservation), which provides for the management and administration of reserves and in particular, “Ensuring as far as possible, the survival of all indigenous species of flora and fauna, both rare and commonplace, in their natural communities and habitats, and the preservation of representative samples of all classes of natural ecosystems and landscape ...”

The **Wildlife Act 1953** (Department of Conservation) deals with the protection and control of wild animals and the management of game species. The **Wild Animal Control Act 1977** (Department of Conservation) provides for the control of harmful species of introduced wild animals. The **Biosecurity Act 1993** (Ministry of Primary Industries), provides a legal basis for excluding, eradicating and effectively managing pests and unwanted organisms.

The purpose of the **Resource Management Act 1991** (Ministry for the Environment) is to promote sustainable management of natural and physical resources. This includes land, water, air, soil, minerals

and energy, and all forms of plants and animals. Its purpose is also to avoid, remedy or mitigate any adverse effects of activities on the environment. The Act is given effect through the preparation and application of **National Policy Statements, Regional Policy Statements, Regional Plans and District Plans**.

### Policies and plans

**National Policy Statements** (Ministry for the Environment) are instruments issued under section 52(2) of the **Resource Management Act** and state objectives and policies for matters of national significance. **Regional Policy Statements, Regional Plans and District Plans** must give effect to **National Policy Statements**.

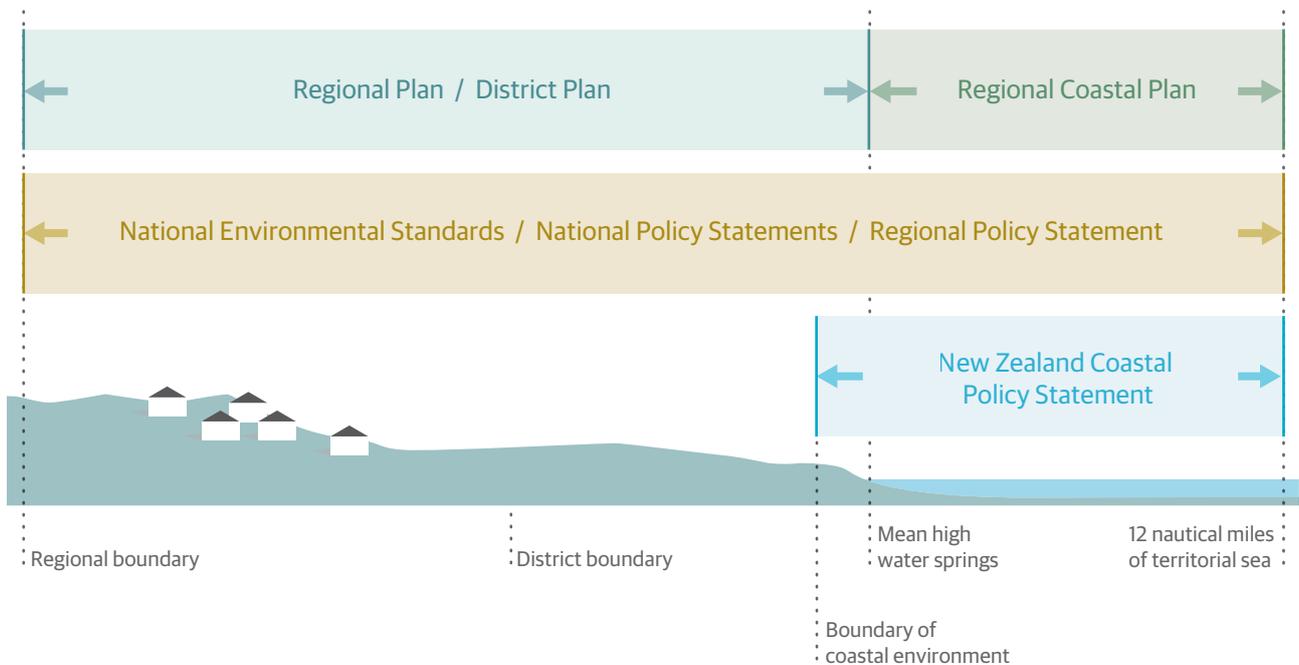
The **Resource Management Act** requires every regional council to prepare a **Regional Policy Statement** which provides an overview of the resource management issues for the region, and states the policies and methods required to achieve the integrated management of the region’s natural and physical resources.

The **Natural Resources Plan** (Greater Wellington Regional Council) sets out the objectives, policies and methods for people and organisations that use the region’s natural resources (air, land, water and coast). This includes the control of the use of land; control of the use of water and the quantity and flow of water in any waterbody; control of the discharges of contaminants into or onto land, air, or water; control of the harvesting or enhancement of aquatic organisms and allocating our natural resources. **Regional Plans** must give effect to a **Regional Policy Statement** and any **National Policy Statement**.

Under the **Biosecurity Act 1993** Greater Wellington Regional Council (GWRC) takes primary responsibility for pest management and produces a **Regional Pest Management Plan**. Wellington City Council has a primary responsibility as a significant land manager under the **Regional Pest Management Plan**. Under this plan, GWRC has the ability to require landowners/occupiers to control certain pest species on private land.

Wellington City Council is charged with the recognition, protection and maintenance of indigenous biodiversity as part of their role under the **Resource Management Act**. Rules in the **District Plan** (Wellington City Council) control the use of land, including subdivision. **District Plans** must give effect to a **Regional Policy Statement** and any **National Policy Statements** and national environmental standards. The **District Plan** provides objectives,

policies and rules relating to significant areas of Wellington’s natural heritage (Conservation Sites), as well as for land valued for its natural character and provision of informal open space (Open Space B ‘natural environment’ and Open Space C ‘inner town belt’). The **District Plan** also includes the Subdivision Design Guide, which lists criteria for using existing landscape, landform and vegetation. Subdivision applications are assessed against these criteria.



**Marine environment**

The marine environment becomes increasingly complex. As well as being covered by the various acts, policies and plans listed above, other agencies also have a role.

As well as their responsibilities under the **Biosecurity Act**, the Ministry for Primary Industries is responsible for fisheries management. The Department of Conservation is responsible for marine reserves and protecting marine species and Greater Wellington Regional Council is responsible for managing the territorial sea.

The Ministry for the Environment is responsible for the Environmental Protection Authority and administering the **Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012**.

The Ministry of Transport is responsible for New Zealand’s Marine Protection Rules, which stop or control discharges of waste, including oil, chemicals and garbage and Maritime New Zealand is responsible for managing maritime transport and its effects, including preventing marine pollution caused by the dumping and disposal of waste in our Exclusive Economic Zone.

The Council's jurisdiction extends only as far as mean high water springs. However, there is no doubt that what happens on the land influences what our harbour and coastal ecosystems. Land management practices have flow-on effects down to the sea, especially via streams. The relationship with this plan and freshwater and marine environments is complex. Wellington City Council has jurisdiction up to the mean high water springs mark. The role of the Council is in advocacy for the marine environment, including supporting other organisation's education programmes around marine biodiversity and marine restoration, and minimising the impacts of land based effects on the marine environment and marine biodiversity. This includes minimising the impacts of infrastructure development within coastal environments, carrying out restoration of coastal habitats above mean high water springs, treating stormwater discharges and leachate from landfills and acknowledging the role that the Council plays in marine based recreation.

### **Other related strategies**

There are also wider issues that affect biodiversity, these include new biosecurity threats, land development for infrastructure (including reclamation of land), rubble disposal in the event of an earthquake, and aquaculture. While these have an effect on biodiversity, they are all dealt with under other plans and policies, as are issues of city wide resilience.

Addressing these other issues are a number of statutes that sit alongside biodiversity strategies, in that their purpose can be interpreted as further supporting the sustainable management of biodiversity (e.g. the **Local Government Act**, the **Land Transport Management Act**), or have some other relationship with activities that will impact on biodiversity (e.g. the **Civil Defence Emergency Management Act** and the **Hazardous Substances and New Organisms Act**).

The New Zealand Government is also a signatory to the International Convention on Biological Diversity 1992. This convention, signed by 193 nations, recognises the global scale of the threats

to biodiversity and provides targets for countries to achieve at a national scale. The New Zealand Biodiversity Strategy reflects New Zealand's commitment to the CBD. It sets out national goals and principles for managing New Zealand's biodiversity.

### **Alignment with other Council strategies**

It can be complicated fitting different aims together, but these Council strategies are designed to interlink and to be both sensitive and clever about supporting the varying aims of each one. This plan needs to be read in conjunction with other Council strategies.

### **Wellington Towards 2040: Smart Capital 2011**

The Council's vision for Wellington is focussed on the future development of the city over the next 30 years. It builds on Wellington's current strengths, acknowledges the challenges the city faces now and over the medium to long term, understands the changing role of cities, and is informed by Wellington's communities. The vision is supported by four community outcomes or long term goals, based on the city's competitive advantage. These are: eco-city; connected city; people-centred city; and dynamic central city.

### **2015-25 Long-term plan and annual plans**

The goals of Wellington 2040 are central to the Council's Long-term Plan 2015-2025. As an Eco-city we can build on current environmental strengths to transition to a low carbon future. Wellington will achieve high standards of environmental performance, coupled with outstanding quality of life and an economy increasingly based on smart innovation.

As Our Natural Capital contains objectives, goals and actions to protect and restore indigenous biodiversity, it follows that the Plan will influence the contents of the Council's Annual Plan and Budget.

All activities proposed for the Council in this Plan will be subject to scrutiny through the Council's annual planning and budgetary process. It is this process which will confirm the priorities and time

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frames, as well as the affordability, of the methods. These decisions will be made within a framework of economic reality. We cannot do everything at once; many of the methods will need to be implemented progressively.

### **Our Capital Spaces 2013**

Our Capital Spaces is an open space and recreation framework for managing and protecting our parks, reserves, and sport and recreation activities over the next 10 years. There are a range of initiatives that fall under four outcomes - getting everyone active and healthy; protecting our birds, nature, streams and landscapes; contributing to Wellington's outstanding quality of life; and doing it together.

### **Climate Change Action Plan 2013**

This plan identifies cost-effective initiatives for Council operations and the community that will help the Council achieve its carbon neutral vision and promote sustainable behaviour. It also aims to enhance green infrastructure and biodiversity.

### **Wellington Urban Growth Plan 2015**

The Wellington Urban Growth Plan is the Council's guide for directing investment and supporting development in growth areas. It provides a framework for sustainable development. It provides strategies to manage the city's future growth (including medium density housing and projects within the City's CBD) while protecting our environment and heritage, and builds on the things that make the city special.<sup>28</sup> The Natural Environment action area is about promoting and investing in actions to reduce the negative impacts of the city's growth and development on the environment.

28 DRAFT Wellington Urban Growth Plan 2014-2043

## Appendix 2 - Ecological significance criteria

Sites of ecological significance are assessed in accordance with the following criteria. These criteria are aligned with regional policy direction as set out under Policy 23 in the RPS. Sites will be considered significant if they receive a high ranking through one or more of the following criteria:

### Representativeness

The ecosystems or habitats that are typical and characteristic examples of the full range of the original or current natural diversity of ecosystem and habitat types in a district or in the region.

Rank	Criteria
High	<ul style="list-style-type: none"> <li>Ecosystems or habitats that are no longer commonplace (less than about 30% remaining)</li> <li>Are poorly represented in existing protected areas (less than about 20% legally protected)</li> </ul>
Medium	<ul style="list-style-type: none"> <li>Indigenous vegetation associated with land environments that have less than 30% remaining in indigenous cover nationally</li> <li>Relatively good quality and relatively large examples of indigenous vegetation associated with sand dunes and wetlands</li> <li>Only or one of the best examples of an ecosystem that was formerly more extensive in the ecodomain</li> <li>Supports a large or exceptionally intact example of an ecosystem that was formerly more extensive in the ecological domain</li> </ul>
Low	<ul style="list-style-type: none"> <li>Similar to other areas that are reasonably well-represented elsewhere in the ecological domain</li> </ul>

### Rarity

The ecosystem or habitat has biological or physical features that are scarce or threatened in a local, regional or national context. This can include individual species, rare and distinctive biological communities and physical features that are unusual or rare.

Rank	Criteria
High	<ul style="list-style-type: none"> <li>Contains a nationally/regionally acutely threatened species</li> <li>Contains a species endemic to Wellington City</li> <li>Contains a species at or near its national distributional limit</li> </ul>
Medium	<ul style="list-style-type: none"> <li>Contains a species nationally/regionally chronically threatened or at risk species</li> <li>Contains a species uncommon in Wellington City</li> </ul>
Low	<ul style="list-style-type: none"> <li>No unusual or rare species</li> </ul>

## Diversity

The ecosystem or habitat has a natural diversity of ecological units, ecosystems, species and physical features within an area.

Rank	Criteria
High	<ul style="list-style-type: none"> <li>• High diversity of ecological and physical features</li> <li>• Supports an originally rare terrestrial ecosystem</li> <li>• Contains a nationally uncommon biological community and/or physical feature</li> </ul>
Medium	<ul style="list-style-type: none"> <li>• Moderate diversity of ecological and physical features</li> <li>• Contains a regionally or locally uncommon biological community and/or physical feature</li> </ul>
Low	<ul style="list-style-type: none"> <li>• Low diversity of ecological and physical features</li> <li>• No unusual or rare biological communities or physical features</li> </ul>

## Ecological context of an area

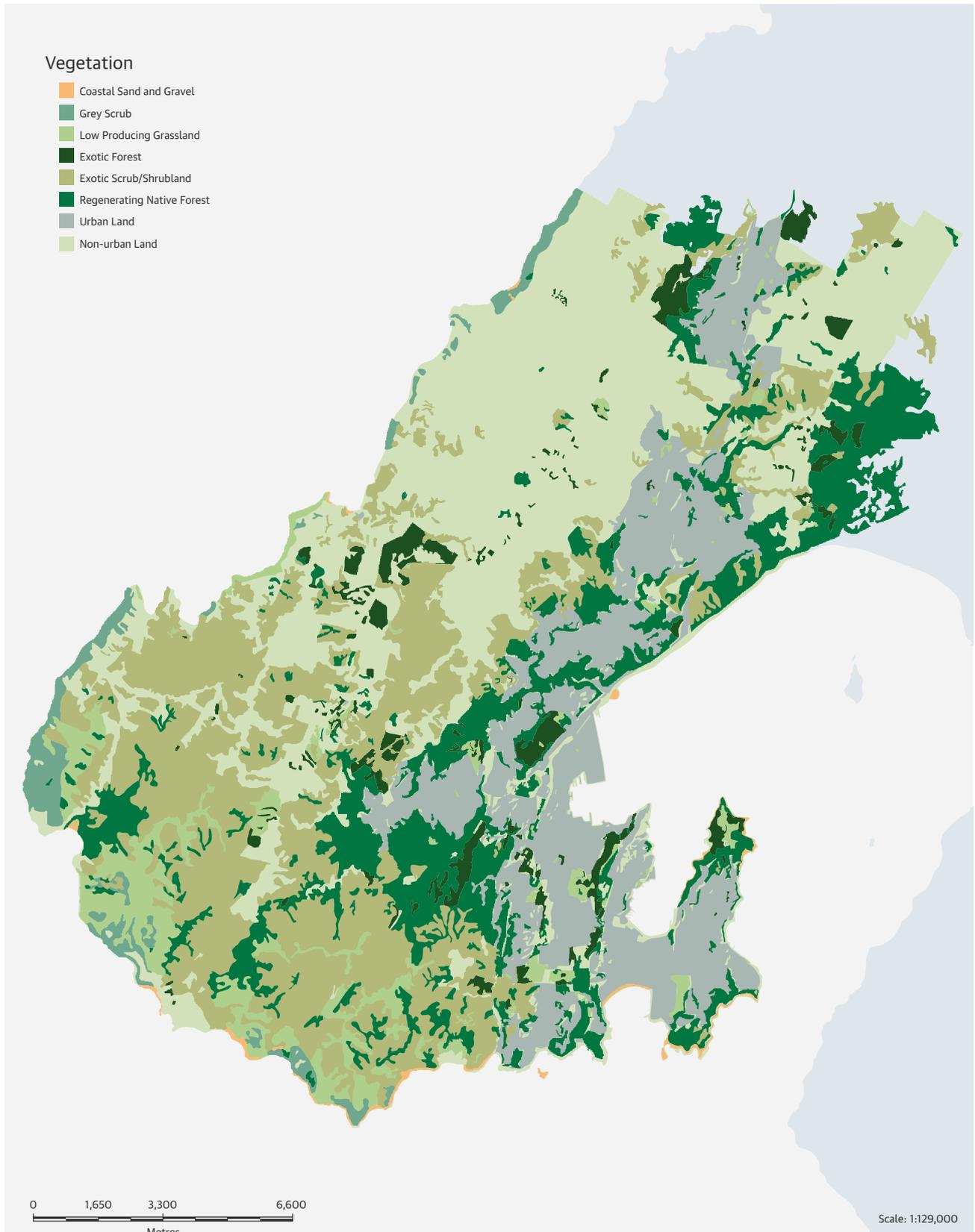
Provides connectivity between fragmented indigenous habitats, buffers or enhances ecological values of a specific site, or provides seasonal or core habitat for specific indigenous species.

Rank	Criteria
High	<ul style="list-style-type: none"> <li>• Enhances connectivity between representative, rare or diverse indigenous ecosystems and habitats</li> <li>• Buffers representative, rare or diverse indigenous ecosystems and habitats</li> <li>• Provides seasonal or core habitat for protected or threatened indigenous species</li> </ul>
Medium	<ul style="list-style-type: none"> <li>• Contributes to the connectivity of now fragmented indigenous habitats</li> <li>• Partial buffering to a known site of ecological value</li> <li>• Provides critical seasonal or core habitat for a particular indigenous species</li> </ul>
Low	<ul style="list-style-type: none"> <li>• No connectivity or buffering function</li> <li>• Similar to other areas that provide seasonal or core habitat for any particular indigenous species</li> <li>• Very isolated from other natural areas</li> </ul>

## Tangata whenua values

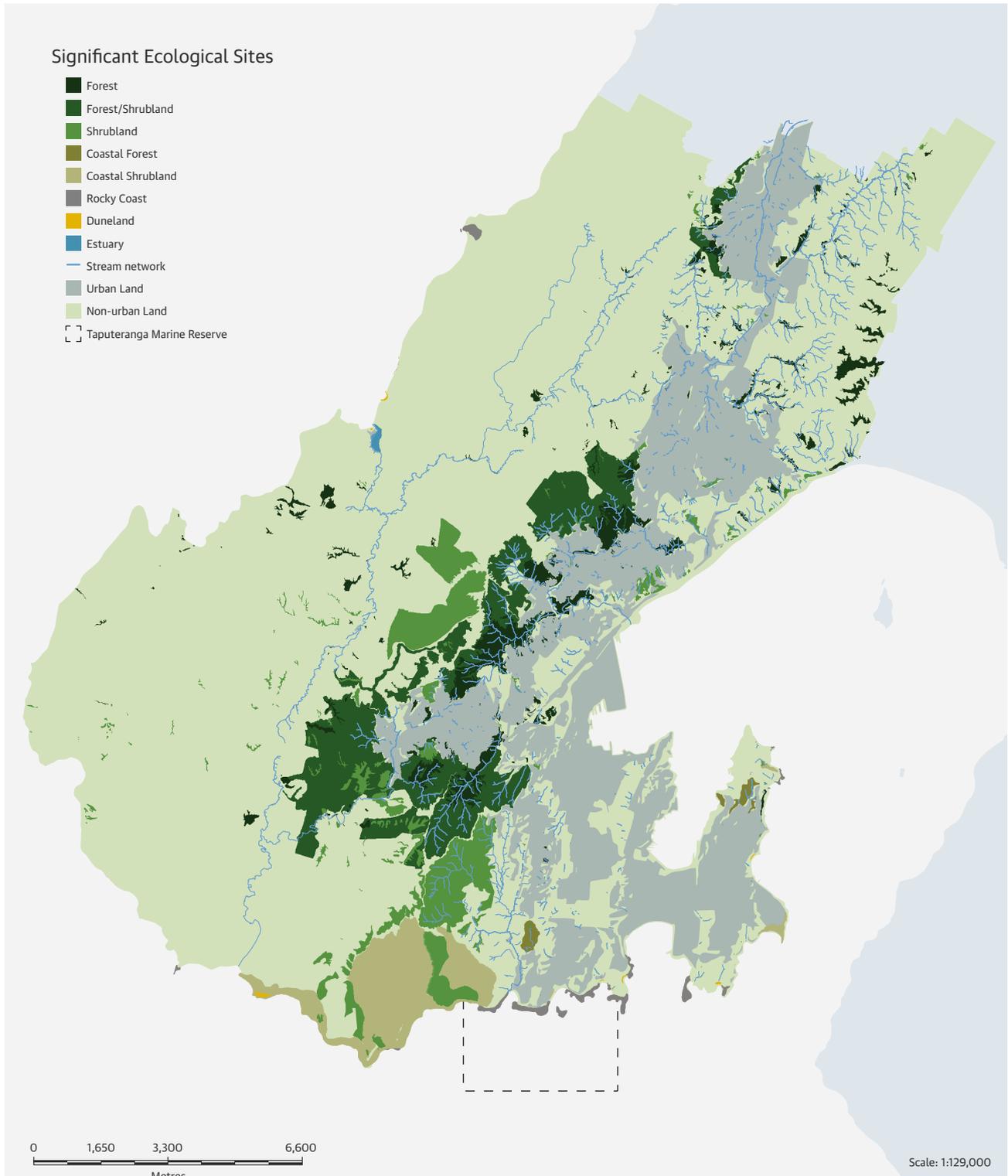
The ecosystem or habitat contains characteristics of special spiritual, historical or cultural significance to tangata whenua, identified in accordance with tikanga Maori.

## Appendix 3 - Wellington's vegetation



# Appendix 4 - Significant Ecological Sites

Please note, these sites are subject to change as priorities are refined and revised, and new information acquired. New sites may be added and others removed during the life of the plan. Current sites and further detail can be found on the Council website.



## Appendix 5 - Nationally threatened, regionally threatened and locally significant species

The threat status of these species may change over time.

### Nationally threatened and at risk species

#### Birds

Common name	Latin name	National threat status
<b>Endemic</b>		
Banded dotterel	<i>Charadrius bicinctus</i>	Threatened - Nationally Vulnerable
Bush falcon /Karearea	<i>Falco novaeseelandiae "bush"</i>	Threatened - Nationally Vulnerable
Kakariki/Red-crowned parakeet	<i>Cyanoramphus novaezelandiae novaezelandiae</i>	At Risk - Relict
Long-tailed cuckoo	<i>Eudynamys taitensis</i>	At Risk - Naturally Uncommon
New Zealand pipit	<i>Anthus novaeseelandiae novaeseelandiae</i>	At Risk - Declining
North Island kaka	<i>Nestor meridionalis septentrionalis</i>	Threatened - Nationally Vulnerable
North Island saddleback	<i>Philesturnus rufusater</i>	At Risk - Recovering
Pateke/Brown teal	<i>Anas chlorotis</i>	At Risk - Recovering
Stitchbird/Hihi	<i>Notiomystis cincta</i>	Threatened - Nationally Endangered
Variable oystercatcher	<i>Haematopus unicolor</i>	At Risk - Recovering
<b>Self-introduced</b>		
Black shag	<i>Phalacrocorax carbo novaehollandiae</i>	At Risk - Naturally Uncommon
Caspian tern	<i>Hydroprogne caspia</i>	Threatened - Nationally Vulnerable
Little black shag	<i>Phalacrocorax sulcirostris</i>	At Risk - Naturally Uncommon
Little penguin	<i>Eudyptula minor iredalei</i>	At Risk - Declining
Little shag	<i>Phalacrocorax melanoleucos brevirostris</i>	At Risk - Naturally Uncommon
Pied shag	<i>Phalacrocorax varius varius</i>	Threatened - Nationally Vulnerable
Pied stilt	<i>Himantopus himantopus leucocephalus</i>	At Risk - Declining
Red-billed gull	<i>Larus novaehollandiae scopulinus</i>	Threatened - Nationally Vulnerable
Royal spoonbill	<i>Platalea regia</i>	At Risk - Naturally Uncommon
White-fronted tern	<i>Sterna striata striata</i>	At Risk - Declining

#### Lizards

Common name	Latin name	National threat status
Barking gecko	<i>Naultinus punctatus</i>	At Risk - Declining
Ornate skink	<i>Oligosoma ornatum</i>	At Risk - Declining
Spotted skink	<i>Oligosoma lineocellatum</i>	At Risk - Relict

## Freshwater fish

Common name	Latin name	National threat status
Longfin eel	<i>Anguilla dieffenbachii</i>	At Risk - Declining
Giant kokopu	<i>Galaxias argenteus</i>	At Risk - Declining
Koaro	<i>Galaxias brevipinnis</i>	At Risk - Declining
Inanga	<i>Galaxias maculatus</i>	At Risk - Declining
Shortjaw kokopu	<i>Galaxias postvectis</i>	Threatened - Nationally Vulnerable
Bluegill bully	<i>Gobiomorphus hubbsi</i>	At Risk - Declining
Redfin bully	<i>Gobiomorphus huttoni</i>	At Risk - Declining

## Plants

Common name	Latin name	National threat status
Gossamer grass	<i>Anemanthele lessoniana</i>	Threatened - Nationally Vulnerable
Jersey fern	<i>Anogramma leptophylla</i>	Threatened - Nationally Vulnerable
Buchanan's orache	<i>Atriplex buchananii</i>	Threatened - Nationally Vulnerable
Grey saltbush	<i>Atriplex cinerea</i>	Threatened - Nationally Critical
Holloway's crystalwort	<i>Atriplex hollowayi</i>	Threatened - Nationally Critical
Kohurangi	<i>Brachyglottis kirkii</i> var. <i>kirkii</i>	At Risk - Declining
Kirk's crassula	<i>Crassula kirkii</i>	At Risk - Naturally Uncommon
	<i>Crassula mataikona</i>	At Risk - Naturally Uncommon
	<i>Crassula peduncularis</i>	Threatened - Nationally Critical
	<i>Crassula ruamahanga</i>	At Risk - Naturally Uncommon
Little spotted moa orchid	<i>Drymoanthus flavus</i>	At Risk - Naturally Uncommon
Shore spurge	<i>Euphorbia glauca</i>	At Risk - Declining
Pingao	<i>Ficinia spiralis</i>	At Risk - Declining
Giant hypolepis	<i>Hypolepis dicksonioides</i>	At Risk - Naturally Uncommon
Leafless mistletoe	<i>Korthalsella salicornioides</i>	At Risk - Naturally Uncommon
Coastal cress	<i>Lepidium flexicaule</i>	Threatened - Nationally Endangered
Cooks scurvy grass	<i>Lepidium oleraceum</i>	Threatened - Nationally Endangered
Thick-leaved mahoe	<i>Melicytus crassifolius</i>	At Risk - Declining
	<i>Melicytus</i> aff. <i>obovatus</i>	At Risk - Naturally Uncommon
Shrubby tororaro	<i>Muehlenbeckia astonii</i>	Threatened - Nationally Endangered
Leafless pohuehue	<i>Muehlenbeckia ephedroides</i>	At Risk - Declining
Lyttelton forget-me-not	<i>Myosotis lytteltonensis</i>	Threatened - Nationally Critical
Sand daphne	<i>Pimelea villosa</i>	At Risk - Declining
Sand tussock	<i>Poa billardiarei</i>	At Risk - Declining
NZ milk tree	<i>Streblus banksii</i>	At Risk - Relict
NZ spinach	<i>Tetragonia tetragonioides</i>	At Risk - Naturally Uncommon
Green mistletoe	<i>Tupeia antarctica</i>	At Risk - Declining

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## Regionally threatened and locally significant species

### Birds

Common name	Latin name
Bellbird	<i>Anthornis melanura melanura</i>
Kereru (Woodpigeon)	<i>Hemiphaga novaeseelandiae</i>
Morepork	<i>Ninox novaeseelandiae novaeseelandiae</i>
North Island Fantail	<i>Rhipidura fuliginosa placabilis</i>
North Island Robin	<i>Petroica longipes</i>
Tui	<i>Prothemadera novaeseelandiae novaeseelandiae</i>

### Lizards

Common name	Latin name
Copper skink	<i>Oligosoma aeneum</i>
Glossy brown skink	<i>Oligosoma zealandicum</i>
Minimac gecko	<i>Woodworthia 'Marlborough mini'</i>
Ngahere gecko	<i>Mokopirirakau aff. Granulatus 'Southern North Island'</i>
Northern grass skink	<i>Oligosoma polychroma</i>
Raukawa gecko	<i>Woodworthia maculata</i>

### Freshwater fish

Common name	Latin name
Shortfin eel	<i>Anguilla australis</i>
Banded kokopu	<i>Galaxias fasciatus</i>

## Plants

Common name	Latin name
Ferns	
Cabbage tree	<i>Cordyline australis</i>
Rimu	<i>Dacrydium cupressinum</i>
Kahikatea	<i>Dacrycarpus dacrydioides</i>
Matagouri	<i>Discaria toumatou</i>
Kiekie	<i>Freycinetia banksii</i>
Houhere	<i>Hoheria aff. sexstylosa</i>
Rewarewa	<i>Knighetea excelsa</i>
Rauhuia	<i>Linum monogynum var. chathamicum</i>
Northern rata	<i>Metrosideros robusta</i>
Maire taiki	<i>Mida salicifolia</i>
Narrow-leaved maire	<i>Nestegis montata</i>
Totara	<i>Podocarpus totara</i>
Miro	<i>Prumnopitys ferruginea</i>
Matai	<i>Prumnopitys taxifolia</i>
Raukaua	<i>Raukaua edgerleyi</i>
Taurepo	<i>Rhabdothamnus solandri</i>
Nikau	<i>Rhopalostylis sapida</i>
Shore dock	<i>Rumex neglectus</i>
Climbing aniseed	<i>Scandia geniculata</i>
Kowhai	<i>Sophora microphylla</i>
Cook Strait kowhai	<i>Sophora molloyi</i>
Sea blight	<i>Suaeda novae-zealandiae</i>
Tawhirikaro	<i>Pittosporum cornifolium</i>

## Appendix 6 - Environmental pests

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This list is subject to change as priorities are refined and revised. New species may be added and others removed during the life of the plan.

### Pest Animals

Common name	Latin name
Argentine ant	<i>Linepithema humile</i>
Australian magpie	<i>Gymnorhina tibicen</i>
Brown bullhead catfish	<i>Ameiurensis nebulosis</i>
Cat	<i>Felis catus</i>
Eastern rosella	<i>Platycercus eximius</i>
European hedgehog	<i>Erinaceus europaeus occidentalis</i>
Feral deer	<i>Cervus elaphus, C nippon, Dama dama</i>
Feral goat	<i>Capra hircus</i>
Feral pig	<i>Sus scrofa</i>
Feral rabbit	<i>Oryctolagus cuniculus</i>
Ferret	<i>Mustela furo</i>
Hare	<i>Lepus europaeus occidentalis</i>
House mouse	<i>Mus musculus</i>
Koi carp	<i>Cyprinus carpio</i>
Mosquito fish	<i>Gambusia affinis</i>
Norway rat	<i>Rattus norvegicus</i>
Possum	<i>Trichosurus vulpecula</i>
Rainbow skink	<i>Lampropholis delicata</i>
Rudd	<i>Scardinius erythrophthalmus</i>
Ship rat	<i>Rattus rattus</i>
Stoat	<i>Mustela erminea</i>
Sulphur crested cockatoo	<i>Cacatua galerita</i>
Tench	<i>Tinca tinca</i>
Wasp	<i>Vespula germanica; Vespula vulgaris</i>
Weasel	<i>Mustela nivalis</i>

## Pest Plants

Common name	Latin name
African club moss	<i>Selaginella kraussiana</i>
Agapanthus	<i>Agapanthus praecox</i>
Aluminium plant	<i>Galeobdolon luteum</i>
Artemesia	<i>Artemesia spp</i>
Artillery plant	<i>Galeobdolon luteum</i>
Arum lily	<i>Zantedeschia aethiopica</i>
Asiatic knotweed	<i>Reynoutria japonica</i>
Banana passionfruit	<i>Passiflora mixta,</i>
Barberry	<i>Berberis glaucocarpa</i>
Bear's Breeches	<i>Acanthus mollis</i>
Blackberry	<i>Rubus fruticosus</i>
Blue morning glory	<i>Ipomoea indica</i>
Blue Passion Flower	<i>Passiflora caerulea</i>
Bomarea	<i>Bomarea caldasii and Bomarea multiflora</i>
Boneseed	<i>Chrysanthemoides monilifera</i>
Boxthorn	<i>Lycium ferocissimum</i>
Broom	<i>Cytisus scoparius</i>
Cape honey flower	<i>Melianthus major</i>
Cape ivy	<i>Senecio angulatus</i>
Cathedral bells	<i>Cobaea scandens</i>
Chilean flame creeper	<i>Tropaeolum speciosum</i>
Chinese and tree privet	<i>Ligustrum sinense; L. lucidum</i>
Climbing asparagus	<i>Asparagus scandens</i>
Climbing dock	<i>Rumex sagittatus</i>
Cotoneaster	<i>Cotoneaster franchetii, C. horizontalis</i>
Darwin's barberry	<i>Berberis darwinii</i>
Egeria	<i>Egeria densa</i>
English ivy	<i>Hedera helix</i>
Elaeagnus	<i>Elaeagnus x reflexa</i>
Everlasting pea	<i>Lathyrus latifolius</i>
Evergreen buckthorn	<i>Rhamnus alaternus</i>
Fairy Crassula	<i>Crassula multicava</i>
Gazania	<i>Gazania spp.</i>
German ivy	<i>Senecio mikanioides</i>
Ginger	<i>Hedychium flavescens, H. gardnerianum</i>

Common name	Latin name
Great bindweed	<i>Calystegia silvatica</i>
Gorse	<i>Ulex europaeus</i>
Gunnera	<i>Gunnera tinctoria</i>
Himalayan balsam	<i>Impatiens glandulifera</i>
Himalayan honeysuckle	<i>Leycesteria formosa</i>
Horned poppy	<i>Glaucium flavum</i>
Indian doab	<i>Cynodon dactylon</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
Japanese spindletree	<i>Euonymus japonicus</i>
Jasmine	<i>Jasminum polyanthum</i>
Kikuyu	<i>Pennisetum clandestinum</i>
Lagarosiphon	<i>Lagarosiphon major</i>
Marram grass	<i>Ammophila arenaria</i>
Mexican daisy	<i>Erigeron karvinskianus</i>
Mile-a-minute	<i>Dipogon lignosus</i>
Mistflower	<i>Ageratina riparia</i>
Montbretia	<i>Crocasmia x crocosmifolia</i>
Nasturtium	<i>Tropaeolum majus</i>
Old man's beard	<i>Clematis vitalba</i>
Pampas grass	<i>Cortaderia jubata; C. selloana</i>
Parrot's feather	<i>Myriophyllum aquaticum</i>
Periwinkle	<i>Vinca major</i>
Pigs ear	<i>Cotyledon orbiculata</i>
Plectranthus	<i>Plectranthus ciliatus</i>
Purple ragwort	<i>Senecio glastifolius</i>
Sea couch	<i>Elytrigia pycnantha</i>
Silver poplar	<i>Populus alba</i>
Smilax	<i>Asparagus asparagoides</i>
Spanish heath	<i>Erica lusitanica</i>
Stinking iris	<i>Iris foetidissima</i>
Tradescantia	<i>Tradescantia fluminensis</i>
Tree lupin	<i>Lupinus arboreus</i>
Tuber ladder fern	<i>Nephrolepis cordifolia</i>
Velvet groundsel	<i>Senecio petasitis</i>
Wild onion	<i>Allium triquetrum</i>

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**Pest trees**

Common name	Latin name
Brush wattle	<i>Paraserianthes lophantha</i>
Buddleia	<i>Buddleja davidii</i>
Cherry	<i>Prunus spp</i>
Cherry laurel	<i>Prunus laurocerasus</i>
Crack and pussy willow	<i>Salix fragili, S. cinerea</i>
Hawthorn	<i>Crataegus monogyna</i>
Holly	<i>Ilex aquifolium</i>
Karaka	<i>Corynocarpus laevigatus</i>
Karo	<i>Pittosporum crassifolium</i>
Monkey apple	<i>Acmena smithii</i>
Sycamore	<i>Acer pseudoplatanus</i>
Wilding conifers	<i>Larix decidua; Cupressus macrocarpa</i>
Wilding pines	<i>Pinus spp</i>

**Absolutely Positively**  
**Wellington City Council**  
Me Heke Ki Pōneke