2050 Ecological Vision for Te Pātaka o Rākaihautū Banks Peninsula (including the Port Hills)

October 2023

The vision:
In 2050 native biodiversity is thriving across Te Pātaka o Rākaihautū Banks Peninsula. Native ecosystems underpin our resilient communities, recognising that when nature thrives, people thrive.

Ka ora te whenua
Ka ora te tāngata

Introduction

The ecological vision for Te Pātaka o Rākaihautū Banks Peninsula has been developed by the Banks Peninsula Conservation Trust (BPCT) with input from many partner organisations, including mana whenua, landowners, Christchurch City Council, Environment Canterbury, the Department of Conservation, and other community groups. The BPCT is proud to promote the ecological vision and acknowledges with gratitude the many contributors who assisted its development. The ecological vision is a resource to be used by the whole community and others are encouraged to adopt it, or adapt it for their own purposes.

Banks Peninsula (which includes Port Hills), with its breath-taking landscapes, diverse ecosystems and precious wildlife, has long captured the hearts of those fortunate enough to engage with this special place. The Peninsula's wide range of habitats support a remarkable biodiversity, from penguins and inanga to wētā and forest birds, from kelp forest and podocarp forest to cliff and mountaintop plants. This biodiversity has great value - as taonga, for recreation, for tourism, and for ecosystem services such as flood protection.

The challenges posed by climate change and human activities have threatened the delicate balance that sustains this ecological gem. The 10 ecological goals outlined here chart a path through those challenges and towards a thriving, resilient and biodiverse future. In adopting this vision, we can take encouragement from the progress made to date. Since the 1920s, when indigenous forest was reduced to only 1% of Banks Peninsula's area, indigenous woody vegetation has steadily increased so that today about 20% of the land is covered in regenerating native vegetation. Remarkably, despite extensive historical losses of forest, few native species were lost locally, and Banks Peninsula remains a biodiversity hotspot for Waitaha Canterbury and for Aotearoa.

The 10 interconnected goals in this vision will guide collective efforts towards the recovery of this unique area, enabling it to flourish. Success depends not on any single entity or a few, but on us all: mana whenua, landowners, agencies, conservation organisations and the wider community, working hand in hand to achieve our shared aspirations. This vision is intended to facilitate collaboration and provide new solutions to complex issues. Together, we can foster a culture of environmental stewardship, implementing sustainable land management practices, and embracing innovative conservation strategies.

On Banks Peninsula we envision a future where native species thrive and ecosystems regenerate, offering sanctuary for both resident and migratory species. The restoration of ecological corridors, the protection of critical habitats, and the reintroduction of locally extinct species will restore the Peninsula's ecological integrity, and provide inspiration for the rest of Canterbury and Aotearoa. The 2050 ecological vision for Banks Peninsula invites us to dream big, and to work tirelessly for a future where our actions today foster the thriving biodiversity of tomorrow. It is a call to unite in creating a better future.

When Nature Thrives, We Thrive – Ka ora whenua, ka ora te tāngata

Penny Carnaby
Banks Peninsula Conservation Trust Chair

The 10 Ecological Goals

This vision outlines 10 interconnected goals which collectively will guide efforts towards enhancing the biodiversity and thriving ecosystems of Te Pātaka o Rākaihautū Banks Peninsula.

Goal 1: Protect all remaining old-growth forest remnants

The deeper soils on Te Pātaka o Rākaihautū Banks Peninsula were once extensively covered in podocarp forest, with hardwood trees and ferns beneath the lofty tōtara, mataī and kahikatea, sometimes with miro and rimu. Sub-alpine areas were dominated by thin barked tōtara with native cedar. The south-east corner of the Peninsula had localised areas of red and black beech.

Podocarp trees were highly prized by settlers for timber, and those growing on the lowlands were among the first resources to be extracted. Forests were further cleared by burning to make land available for farming. These tree species have a lineage dating back to Gondwana. Their lives can span many hundreds of years, sequestering and storing carbon while they grow. They are important for wildlife, providing valuable food sources for even the largest forest birds, kerurū and kākā, as well as nesting and roosting sites. Older trees with holes and hollows provide nesting places for ruru, mohua, riflemen, bats and kiwi. Healthy forest soils support a rich and diverse ecosystem.

These remnant forest types are now rare, but are important windows into the previous native ecosystems. They are small fractions of what once existed, and are now mostly small, isolated patches. Often their margins are vulnerable to wind, stock damage and weed pests. Elsewhere, there are single old-growth trees which are isolated from forests and even more vulnerable to damage. These remnant trees and forests hold the genetic material of the next generation, as well as providing food and shelter for large numbers of birds, insects and other wildlife.

Now is our chance to covenant or otherwise legally protect and manage the small remaining areas of these mighty forests before they are lost. They can also be protected by restoration planting of native trees around the edges to enlarge the forest patches and provide shelter to the older trees in the centre.

Goal 2: Protect the full range of rare[1] and naturally uncommon ecosystems

From its summits down to the coasts and plains around its perimeter, Te Pātaka o Rākaihautū Banks Peninsula has many distinctive geographic features supporting specialised ecosystems that are rare or naturally uncommon in Aotearoa. They have distinctive soils and climatic conditions which support uncommon flora and fauna. These ecosystems are varied and mostly small and unforested. To survive, these need protection from pests, grazing animals, introduced weeds and from development.

They include:

- Inland cliffs, scarps and tors, which are often home to threatened or rare plants and animals, such as the nationally critical Lyttelton forget-me-not, Banks Peninsula sun hebe, waitaha gecko and Banks Peninsula tree wētā.
- Wetlands, such as lagoons and estuary margins, seepages and flushes on valley floors and slopes, and ephemeral wetlands, which each have their own characteristic assemblage of plants and animals.
- Boulderfields, which create microclimates and provide refuges for native shrubs, invertebrates and lizards.
- Coastal cliffs and rock stacks, which provide nesting, burrowing and roosting sites for penguins, shags, petrels and other sea-going birds, and for lizards.
- Sand-dunes, shingle beaches, coastal turfs and sea mammal haul-out areas, which each have different characteristics suited to specific assemblages of plants, invertebrates, lizards and birds.

These special ecosystems make a significant contribution to national biodiversity.

[1] These ecosystems are now classified as naturally uncommon. See:
https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/

Goal 3: Protect streams and coastal seas through better land management

Aquatic habitats need to be healthy in order to support the many native species that depend on freshwater and marine environments for part or all of their life cycle. Freshwater and marine ecosystems are greatly affected by the conditions on the land adjacent to them. Silty sediment chokes up streams and coastal waters, greatly reducing their ability to support life. High nutrient loads promote excessive algal growth.

Good land management can greatly reduce sediment and nutrient inputs into streams and coastal seas. On steeper slopes and near coastal margins, native forest cover helps to reduce silt run-off. The forest and its soils absorb water and release it slowly, reducing sediment movement and the risk of flooding. Appropriate indigenous vegetation along the stream margins all the way down the catchment intercepts silt and nutrient run-off, reducing sediment and nutrient overload in streams and wetlands. Overhanging trees shade waterways, reducing light and heat reaching the water, which further reduces the likelihood of detrimental algal blooms. Falling leaves and other terrestrial inputs provide food for a healthy in-stream food web that supports aquatic invertebrate larvae, tuna/eels, adult galaxids (whitebait species) and kōura/freshwater crayfish. In slow-moving wetland areas, vegetation offers further filtration and buffering, which improves water quality. Clear water then reaches the sea, promoting healthy beds of kelp and seagrass, which support nurseries of fish and other marine life.

Many of our iconic native species such as kororā/little blue penguin, tītī/petrels, spotted shags, tuna/eels and inanga/whitebait rely on the healthy state of the land, freshwater and the marine environment to survive.

Inanga and other whitebait species need good water quality throughout their life cycle

Adult inanga live in coastal wetland areas (creeks, rivers, estuaries, etc.) and feed on tiny insects that also need healthy freshwater to breed. A few days before the full moons and new moons of February to May the adult inanga travel downstream to the place where the freshwater meets the incoming seawater. They wait for the very high waters of the spring tide to carry them up into flooded vegetation on the edge of the streams where they work their way into the base of dense, grassy vegetation to lay their eggs. The eggs are hidden there, shielded from natural predators (herons and eels) and from the sun's UV, and, ideally, safe from trampling stock. They develop over the next few weeks until they are ready to hatch on the next high spring tide. The tiny larvae are carried downstream to the sea, where they feed on plankton in coastal waters for 6 months until spring arrives, when they migrate back into clean wetlands, rivers and streams.

Goal 4: Establish four large biodiversity hubs of indigenous vegetation

Fragmented forest patches have small interiors with most of the habitat being close to an edge. Edges are more vulnerable to drying winds, and to weed and predator incursion. This limits the resilience of the plants, animals, important soil-living microbes and fungal networks, especially under a warming climate, thus reducing the diversity of species that can survive, and compromising those that remain. This goal is to establish four large-scale hubs, of more than 1000 hectares each, of connected and protected indigenous vegetation. These hubs will contain old-growth and regenerating forest and naturally uncommon ecosystems, providing ecosystem resilience from summit to sea.

Establishing large hubs of continuous native habitat from summit to sea and across spurs, valleys and rocky tops enables a rich diversity of native plants and animals to thrive. They support larger populations, increasing genetic diversity. Animal species can move safely between food and water sources, and adapt as the seasons and climate change; this is particularly important for smaller species that are less able to cross large open gaps in a more fragmented landscape, e.g. tomtit, rifleman and gecko.

These areas of 1000 hectares or greater will be in various ownerships, with large parts of them likely to be in private ownership sympathetic to this goal, such as with the Wildside which has Hinewai Reserve at the core. There may be residential areas within them.

Goal 5: Enhance native biodiversity within the rural environment

Most of Te Pātaka o Rākaihautū Banks Peninsula is rural, and this environment is a diverse mix of native and exotic elements. Much of the native remnant ecosystems are embedded within a matrix of primary production (agriculture, forestry, horticulture, etc.) and with areas of human habitation within it (farm houses, baches and small villages). Wildlife species move across this landscape, from mountaintop to lower country and down to the coastal margin or Kā Pākihi Whakateketeka a Waitaha Canterbury Plains, from one bush area to the next, or from stream to lake and sea, in order to find food, to find safe shelter, to breed, and to cope with the changes in seasons and weather patterns. With the worldwide shift in climate, this habitat flexibility is becoming increasingly important.

Many native birds, such as kererū, bellbird, tūī and fantail, spend considerable amounts of time within gardens and amongst farmland, opportunistically moving with the seasons. Other smaller species, like riflemen, lizards and beetles, struggle to cross large open stretches without native cover and safe shelter from pests. Springs, streams and rivers, critical for production and settlement, are also critical for biodiversity.

Sympathetic management of the native ecosystems within the areas of primary production and settled areas is important in order to sustain native species and to build ecosystem resilience into the landscape. Developing resilience against climate change will benefit both the environment and the people that live there. There are many things that can be done. These include restoring forest corridors and other habitat connections, waterway and stream-edge restoration, sympathetic road verge management, use of native species in shelter belts, and weed and animal pest control. These actions will improve ecosystem services and bring benefits to the primary production values and to human wellbeing. Owners can choose to legally protect their areas of native habitat in perpetuity through covenanting.

Goal 6: Increase the abundance of rare and uncommon native species

Te Pātaka o Rākaihautū Banks Peninsula has a wide range of native biodiversity, of varying abundance. Some native species are relatively common and are found throughout the Peninsula, such as fantails, silvereyes and black-back gulls. Some are locally uncommon, such as ruru, tūī, tītī and nikau palms. Some rare species are classified as nationally threatened, at risk or locally endemic, including hoiho, kārearea, spotted shag, Banks Peninsula tree wētā, a number of endemic moths, Lyttelton forget-me-not and Cooks scurvy grass. This goal is focused on the less common species, to increase their abundance and range. This will make their populations more secure, increase the biodiversity of areas they spread into, and enable people to encounter and appreciate them more widely than they can at present.

Many animal and plant species on the Peninsula appear to have increased in abundance over the last few decades as a result of habitat protection, pest control, and the general increase in native woody vegetation - including bellbird, tomtit, kereru and five-finger. Kororā have benefitted from localised predator control. However, increases in populations may be quite localised, and some species may still be declining or relatively neutral. All are vulnerable to loss of habitat and to increases in predators.

This goal aims to ensure that native fauna and flora become more abundant and widespread across the Peninsula. While it is focused mainly on less common species, it would also cover any common species that started to decline. For fauna that are dependent on the marine environment, such as tītī and other petrels, penguins, shags, tuna and inanga, their abundances on land will be partially dependent on what is happening in the marine environment, potentially some distance away from Banks Peninsula.

Achieving this goal relies on success in some of the other goals, and evaluation of it requires affordable monitoring methods that can detect changes in species' abundance.

Goal 7: Re-establish populations of locally extinct plant and animal species

In the past, Te Pātaka-o-Rākaihautū Banks Peninsula was home to some native species that are now missing. Some of these are gone forever, such as moa, South Island piopio, laughing owl and the Waitaha penguin. Other species survive elsewhere, but were lost from the Peninsula, most likely due to extensive deforestation and the impact of introduced predators and hunting. The absence of these missing species has reduced the native biodiversity of the Peninsula. Some of these are iconic species that characterise Aotearoa's unique wildlife. Restoring local populations of these species will enhance local biodiversity.

As areas of suitable habitat expand and the impact of introduced predators is reliably managed, it will become increasingly feasible to reintroduce some of these missing species from suitable nearby source populations. The Peninsula has already seen the successful reintroduction of tūī, which had become locally extinct in the early 1990s. Several invertebrate species have been successfully reintroduced to Ōtamahua Quail Island. These species are all reproducing and forming self-sustaining populations.

Further potential candidates for reintroduction could include tuatara, tokoeka/South Island brown kiwi, seabird species including pakahā/fluttering shearwater, kakaruai/South Island robin, kākā, kākāriki/yellow crowned parakeet, mohua/yellow-head, takahē and yellow mistletoe.

In general, re-establishment is most successful when the causes of the original loss have been addressed, the species' habitat needs are met and the threat from introduced predators is minimised. Since some of the species listed above nest in tree holes and hollows, and the Peninsula currently has few ancient trees with suitable holes, artificial nest-boxes could be installed as a substitute. Despite the anticipated elimination of feral predators, flightless birds may still be at risk from domestic cats and dogs and so may only be successful inside predator-proof fences.

Me he korokori tūī
How eloquent is he who has the throat of a tūī

By 2000, tūī had effectively died out from the Peninsula, with only occasional sightings of single vagrant birds. And so, the community, with Agency support and appropriate research, translocated 72 tūī from Maud Island, Marlborough Sounds, to Hinewai Reserve in 2009 and 2010. These tūī, and many of their hatchlings, have coloured leg bands so that they can be identified and their movements monitored. A team of volunteers in the Banks Peninsula Tūī Restoration Group have spent thousands of hours, observing, recording and managing this information. The work is overseen by Dr Laura Molles.

Goal 8: Eliminate or control pest animals to protect native biodiversity

Introduced mammalian pests are now widespread throughout Aotearoa and have played a major role in the extinction story. They will continue to threaten native species if left unchecked. These pests can be divided into two main groups:

- Predator pests that eat wildlife, including birds, lizards and invertebrates. These include ferrets, stoats and weasels, feral cats, hedgehogs, rats and mice. Possums eat chicks and eggs, and pigs eat eggs and invertebrates.

- Browsing pests that imperil our biodiversity by weakening the forest structures, compromising regeneration, and targeting certain plant species they find particularly palatable. These include goats, deer (red and fallow), pigs, possums, hares and rabbits. Rodents also eat plant seeds, seedlings and flowers, thus preventing native plant species regeneration.

Pest Free Banks Peninsula (PFBP) was established in 2018 by a collaboration of organisations with conservation functions on Te Pātaka o Rākaihautū Banks Peninsula. The programme is facilitated by BPCT and is a community-led agency supported initiative working towards realising the PFBP goal.

PFBP aims to eliminate all feral browsing pests across the Peninsula, and reduce all predator pests to zero, or as close to zero as possible. It may not be possible to eliminate all of these pests, e.g. rodents, however the intention is to reduce populations to a level that does not threaten biodiversity.

For it to be technically feasible, achieving this goal assumes that the tools for pest control continue to be developed.

This goal aligns with the national 'Predator Free New Zealand 2050' programme but is more comprehensive.

Goal 9: Eliminate or control 'transformer' ecological weeds

Ecological 'transformer' weeds are non-native plants, usually garden escapees, that can smother, outcompete and prevent natural regeneration of our ecosystems. These include pine species, sycamore, old man's beard, banana passionfruit, Chilean flame creeper, Spanish heather, spur valerian, pig's ear and pride of Madeira. They also threaten our native fauna that relies on healthy native ecosystems. Ecological weeds can be trees, shrubs, climbers, herbaceous, succulent, freshwater or marine plants, and can spread by many different means, e.g. wind, water currents, birds, people and other animals. Typically they are fast growing, able to outcompete our native species, or are better adapted than native plants to environmental pressures which used to be uncommon in Aotearoa, such as wildfires or soil disturbance by mammals. Some weeds (e.g. pines, gorse) promote the spread of fire, which worsens the risk to native ecosystems and to human property.

If left unchecked, such weeds can expand exponentially and become increasingly costly to control. It is therefore important to understand which weeds pose a particular threat to native habitats, ensure new ones do not establish, and that new infestations are eradicated before they spread. Understanding how they proliferate is important to understanding how to control them. Climate change is expected to increase the conditions that suit many weed species, and so controlling them now is a priority.

Goal 10: Improve native habitat corridors between the Peninsula, urban Christchurch and the rest of Canterbury

Native bird species move seasonally for food, nesting sites or in search of breeding partners and some species will populate new areas if conditions are suitable. Large bush birds such as kerurū, tūī and kaka are capable of flying large distances such as between the Te Pātaka-o-Rākaihautū Banks Peninsula and the alpine areas, foot hills and plains of Waitaha Canterbury. Smaller bush species such as bellbird, fantail and warbler move smaller distances between bush patches and their seasonal movements between the Peninsula hills and the gardens and parks of Christchurch City are well recorded. The many significant wetlands at the foot of the western and northern margins of the Peninsula attract huge numbers and species of wetland birds from far afield, some from great distances across the oceans. This goal aims to develop and enhance native habitat areas and corridors to facilitate safe movement of native species through the Peninsula, urban Christchurch and across Canterbury, and therefore help support more resilient populations of native birds.

The hills and valleys of the Peninsula that form the zone of contact with Kā Pākihi Whakateketeka a Waitaha Canterbury Plains run from the mouth of Te Roto o Wairewa Lake Forsyth round past Tai Tapu to the mouth of the Ihutai Avon-Heathcote estuary at Sumner. The Port Hills, from Gebbies Pass to Godley Head, define a substantial portion of this contact zone, and are part of the Peninsula's connection with Selwyn District and also with urban Ōtautahi Christchurch. The Port Hills' northern slopes lost most of their forest cover in the first 600 years of human settlement, and large areas have been cloaked in native tussock for several centuries. This has reduced available habitat for forest species, such as larger bush birds. Only small remnants of old-growth forest remain, such as Ahuriri Bush, but there has been native regeneration in damper sites and Christchurch City Council and others have been undertaking restoration plantings for many years.

The risk of fire here and across the Peninsula is a consideration when restoring forest habitat. Native plantings can take many decades to establish in dry conditions but generally carry fire less easily than many exotic species if well planned. A range of protections can be considered when planting, including designating fire break areas, selecting fire resistant native species particularly for around the margins of planted areas and in home shelterbelts, ensuring clear zones around houses and powerlines, and incorporating ponds for firefighting and for wildlife habitat.

Developing networks of native habitat linking through the hills and valleys on the western and northern margins of the Peninsula to the wetlands, parks, gardens and reserves will benefit indigenous biodiversity and facilitate natural migrations. Various community-led groups are already working towards this goal, including Whaka-Ora, initiated by Te Hapū o Ngāti Wheki to replenish the mauri of Lyttelton Harbour, and Te Kākahu Kahukura (TKK), supported by BPCT, Te Hapū o Ngāti Wheki, Summit Road Society and Living Springs. Te Ara Kakariki is planting forest corridors on the plains.

Appendix 1: Why Te Pātaka o Rākaihautū Banks Peninsula is worth protecting

Te Pātaka o Rākaihautū Banks Peninsula is an extraordinary geological region and the biodiversity jewel of Ōtautahi Christchurch and Waitaha Canterbury. Its origins as an offshore volcanic island, its large size (about 100,000 hectares, making it the largest peninsula in Aotearoa), and its location as a high-altitude, high-rainfall counterpoint to the extensive low-altitude, low-rainfall plains of the eastern Te Wai Pounamu South Island, all contribute to its distinctive characteristics. Its geological and island origins underpin the extraordinary diversity of life found upon Banks Peninsula, and have made it a hotspot for local endemism – unique species that exist nowhere else in Aotearoa or the world.

The island that is now Banks Peninsula was formed by offshore volcanic activity over a period from twelve to six million years ago. When the volcanic activity finally ceased, the craters centred on Lyttelton and Akaroa eroded into today's harbours as they were invaded by the ocean. Plant and animal life colonised the island and continued to evolve, separated from their mainland relatives. Eventually, about 20,000 years ago, the out-washed gravels from the glaciated Southern Alps of the South Island, which fanned out to form the Kā Pākihi Whakatekateka a Waitaha Canterbury Plains, reached the volcanic island and joined it to the rest of the South Island, forming the Peninsula we know today.

The eroded volcanic landform creates a remarkable diversity of microclimates, thus providing exceptional habitat diversity – from the windswept mountain tops (the highest Mt Herbert at 919m), rugged rocky bluffs, tors, coastal cliffs and islets, to the harbours and outer bays, deep fertile valley floors, streams and estuaries. On top of this intricate form, the volcanic soils, overlaid with wind-blown glacial loess from the plains, and a legacy of millions of years of burrowing seabirds depositing guano, formed rich fertile soils. With the plains joining the island to the mainland, large quantities of sand (formed from glacier-ground then river-worked rock from the Alps) constantly carried down to the sea by Canterbury's braided rivers, got transported around the Peninsula's coast by long-shore drift, settling out into pockets around the base of the new Peninsula, creating many and varied beaches, estuaries, wetlands and dune systems.

Before humans settled here, the Peninsula was almost entirely forested. On the mid to lower slopes and alluvial valley floors, lofty tōtara, matai and kahikatea (podocarps) towered over understoreys of hardwood trees and shrubs, climbers, tree ferns and ground ferns etc. The warmer coastal parts of these forests included frost-tender northern species such as nikau, kawakawa and tītoki. The higher altitude forests had native cedar and Hall's/thin-barked tōtara emerging above the hardwood tree canopy. In the coolest and wettest uplands of the south-east corner of the Peninsula, red and black beech forests out-competed the podocarp species. The rocky slopes, cliffs and sub-alpine peaks were clothed in stunted forests with diverse shrublands, indigenous herbs and grasses. These forests and the wetlands and beaches would have been raucous with birdlife, with large flightless birds like the moa, takahē and kiwi being common. Rivers and estuaries would have teamed with invertebrates and fish, and nesting seabirds would have been abundant.

With human arrival, starting about 900 years ago, a rich history of cultural and economic activity began. However, impacts of human activities accelerated, especially in the last two centuries, resulting in significant ecological and environmental damage. By 1920, the forests were reduced to 1% of their original cover, and the loss of woody vegetation caused vulnerable soils to erode and slip, leading to sediment increase in waterways. The loss of habitat, as well as the introduction of feral predators and browsers (including rats, cats, mustelids, possums, goats, pigs and deer), caused the loss of many species, including kākā, kākāriki, tītī, piopio, saddleback and tuatara. The introduction of weedy plant species also threatened vulnerable indigenous species and habitat types. Recently, however, with changing farming practices and values, native woody vegetation on the Peninsula has been steadily increasing, and about 20% of the land is now covered in regenerating forest.

Remarkably, the Peninsula remains a biodiversity hotspot for Canterbury and for Aotearoa. There is an astonishing number of locally endemic species, including seven plant species and many invertebrate species, such as cicada, wētā, beetles, moths, etc This reflects the Peninsula's origins as an island. Some nationally vulnerable species are thriving here too. Very few plant species have been completely lost from the Peninsula, and the fauna remains very diverse. Several nationally rare lizard species have sizeable populations, and there is diverse birdlife due to the range of habitats – bush, freshwater and coastal. That so many of the original native plants and animals have survived is due to the sheer size of the Peninsula, its varied topography (from damp nooks and crannies to dry rocky outcrops) and the forethought of some landowners who set aside and continue to protect small areas of original forest.

Banks Peninsula is uniquely placed geographically and ecologically as a biodiversity hotspot, a seeding node, and a storehouse of carbon for Christchurch and the wider Canterbury area.

Appendix 2: Why indigenous biodiversity is important

Biodiversity is vital for our survival. Its protection is at the heart of the United Nations Convention on Biological Diversity, one of the three Conventions under the Rio Summit. New Zealand's National Policy Statement for Indigenous Biodiversity sets the direction for the country to protect, maintain and restore indigenous biodiversity. We are closely connected to the land and rely on nature for our food, water, health and wellbeing. For Māori, kaitiakitanga is integral to the spiritual, cultural and social life of tangata whenua, and there are specific processes and practices for looking after the environment.

No other country can protect the ecosystems, species and endemics of Aotearoa; we have to protect them. Extinction is irreversible, and environmental degradation is costly to undo.

Ecosystems and the various species and elements within them are interdependent. Nature, over millions of years of trial and error (aka evolution), established a vast diversity of species that were adapted to the local climatic conditions, soils and other environmental variables to form well-functioning ecosystems. Millions of kilometres of fungal hyphae (filaments) in the soil deliver micronutrients to plants, which in turn supply the fungi with the food they need (produced by photosynthesis). Micro- and macro-organisms, e.g. worms, feed on leaf litter and other forest debris, turning it into good quality, well aerated soil, and produce a kind of glue that helps prevent drying out and wind erosion. Above-ground invertebrates help spread propagules such as fungus spores within a wider area. Vertebrates, including birds, bats and lizards, and invertebrates, such as native bees and wētā, help with pollination and seed dispersal, in return for food in the form of nectar, berries etc., while assisting the continual renewal of the ecosystem. The more diversity, the greater the range of services that are exchanged, and the more resilient the overall system becomes.

Collectively, other 'ecosystem services' enabled by a fully functioning indigenous ecosystem include:

- The canopy and roots of native cover and a healthy soil structure help attenuate water flow and hold soil in place. This protects the soil from erosion and reduces the damage from extreme rainfall events. It also protects the soil from desiccation in sustained drought events. With climate change, these weather extremes, which threaten human property and infrastructure through flooding, slips and fires, are expected to become more common.

- At a global level, as a result of the exchange of gases by photosynthesising plants, absorbing CO_2 and releasing O_2, storing the carbon in their mass and transferring some to the soil, the biosphere regulates the atmosphere within the stable range that we all depend on.

Losing any element of a diverse ecosystem reduces its functionality and its ability to renew itself. If we restore as much as possible of the ecological systems that evolved here, we will improve the integrity of the land and the overall wellbeing of the people who live and make a living here.